Section 4

SOLAEGUI
ENGINEERS

May 12, 2020

Ms. Amber Sosa
City of Sparks
431 Prater Way
Sparks, Nevada 89431

Re: Pioneer Meadows Village 6 Trip Generation Review

Dear Amber:

This letter contains the findings of our trip generation review of the proposed Pioneer Meadows Village 6 update. The project is located northeast of the Wingfield Hills Road / Rolling Meadows Drive intersection in the City of Sparks. The former Pioneer Meadows Village 6 plan included 183 single family homes. The current submittal includes 193 single family homes. Copies of the former and current site plans are attached.

Trip generation calculations are based on the Tenth Edition of *ITE Trip Generation*. ITE land use #210 Single Family Detached Housing is used. Table 1 shows the trip generation summary for both the 183 and 193 lot site plans.

TABLE 1
TRIP GENERATION

LAND USE	ADT	AM PEAK HOUR TOTAL	PM PEAK HOUR TOTAL
Former Site Plan Single Family Detached Housing 183 Dwelling Units	1,813	135	181
Proposed Site Plan Single Family Detached Housing 193 Dwelling Units	1,904	143	191
Change	+91	+8	+10

As indicated in Table 1, trip generation totals from the former plan included 1,813 average daily trips with 135 AM peak hour trips and 191 PM peak hour trips. Trip generation totals for the updated unit count include 1,904 average daily trips with 143 AM peak hour trips and 191 PM peak hour trips. These new proposed totals include 91 more average daily trips with 8 more AM peak hour trips and 10 more PM peak hour trips than the former site plan.

Solaegui Engineers Ltd. • 715 H Street • Sparks, Nevada 89431 • 775/358-1004 • FAX 775/358-1098
Civil & Traffic Engineers
e-mail: psolaegui@aol.com

We have been told that overall Pioneer Meadows density is still below the original approved unit count even with these ten additional homes.

We trust that this information will be helpful to you. Please contact us if you have questions or comments.

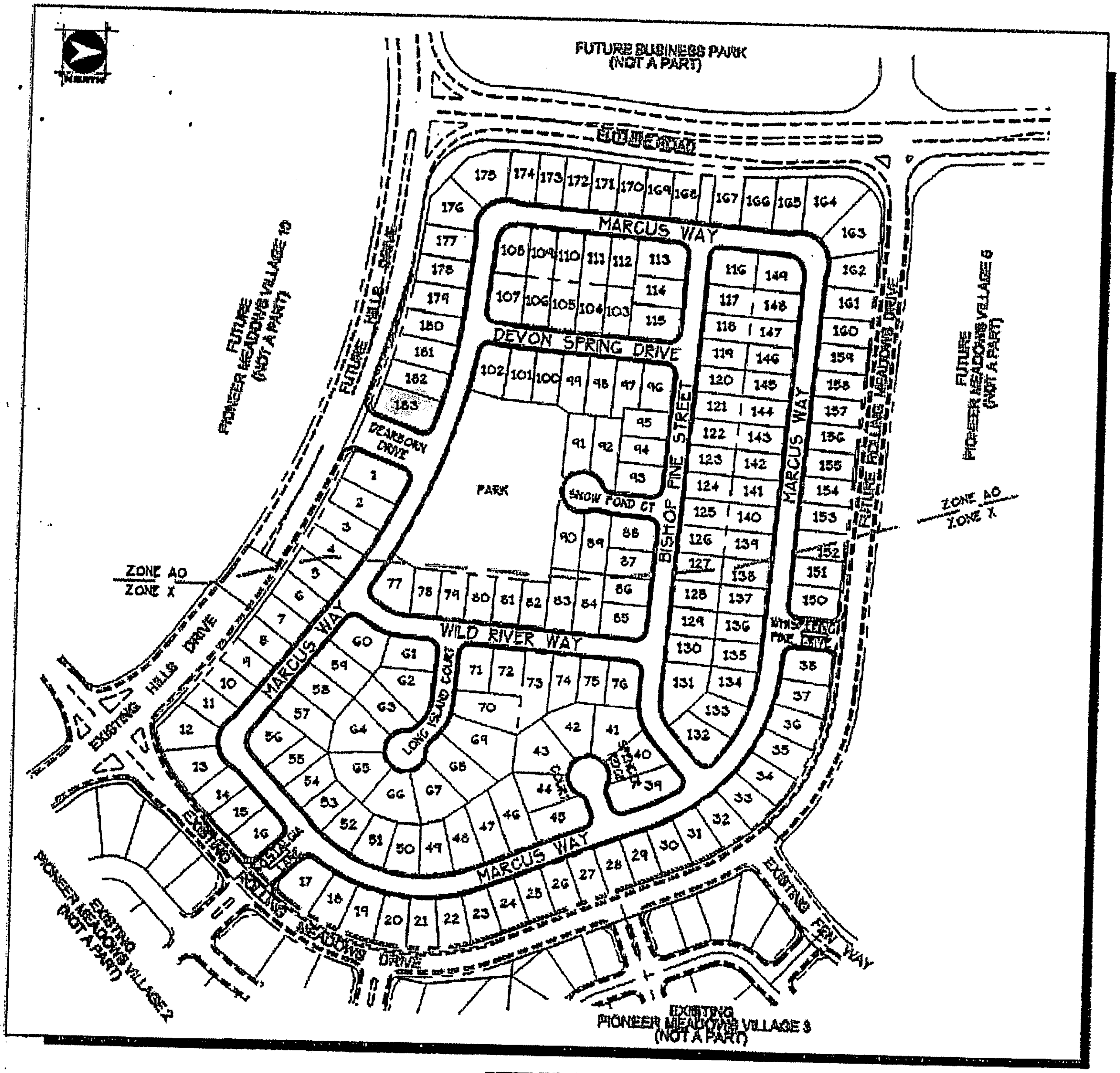
Very truly yours,
SOLAEGUI ENGINEERS, LTD.

PROFESSIONAL ENGINEER
PAUL W. SOLAEGUI
CIVIL
7165
NEVADA

Paul W. Solaegui, P.E.

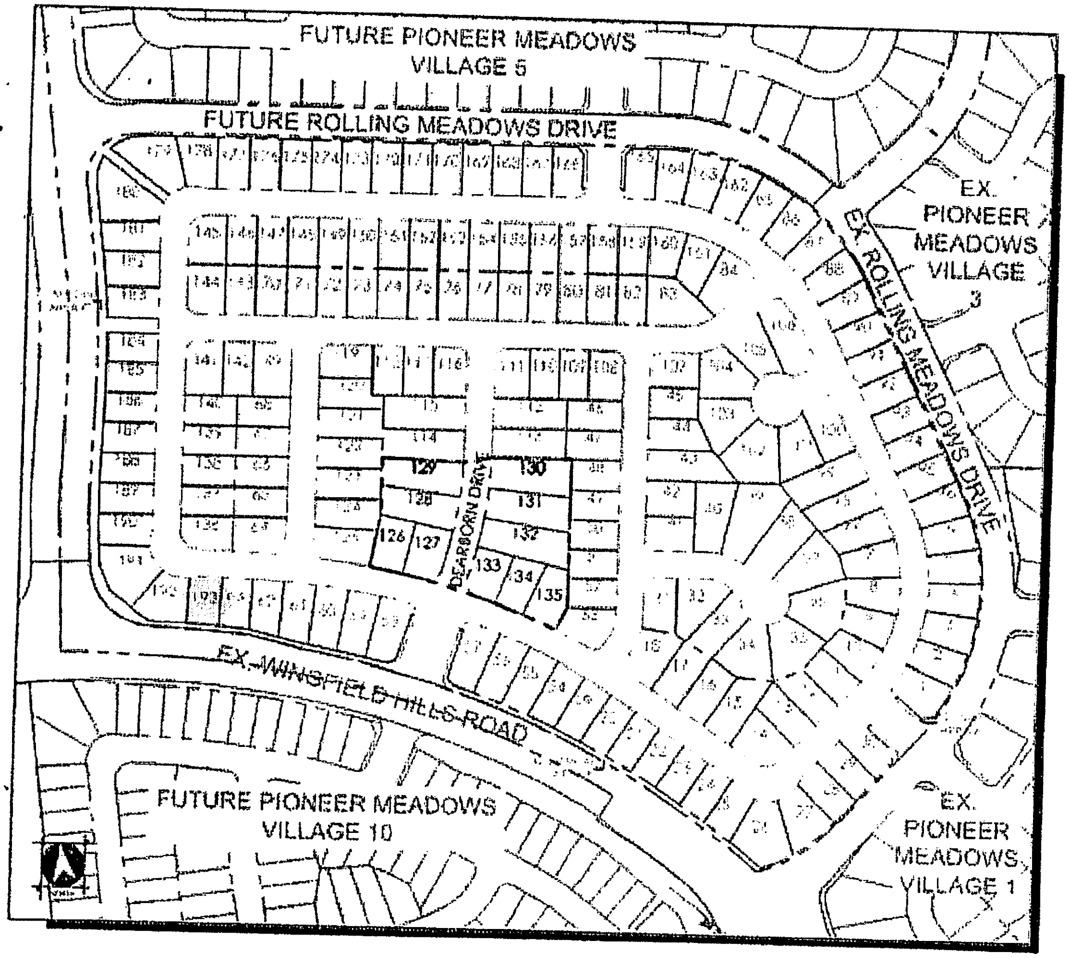
5-12-20
EXP 6-30-20

Enclosures
Letters/Pioneer Meadows Village 6 Trip Generation Letter



SITE PLAN

NOT TO SCALE



SITE PLAN

NOT TO SCALE

Single-Family Detached Housing
(210)

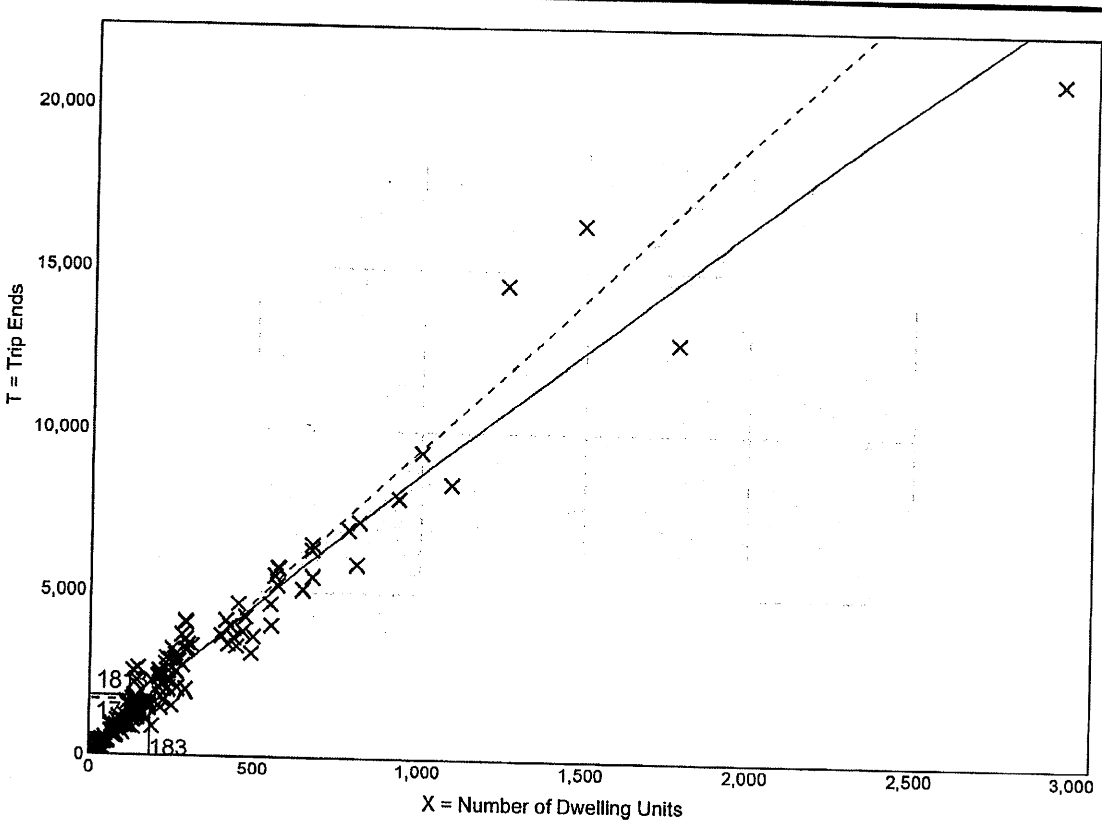
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 159
Avg. Num. of Dwelling Units: 264
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.44	4.81 - 19.39	2.10

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.92 Ln(X) + 2.71

R^2= 0.95

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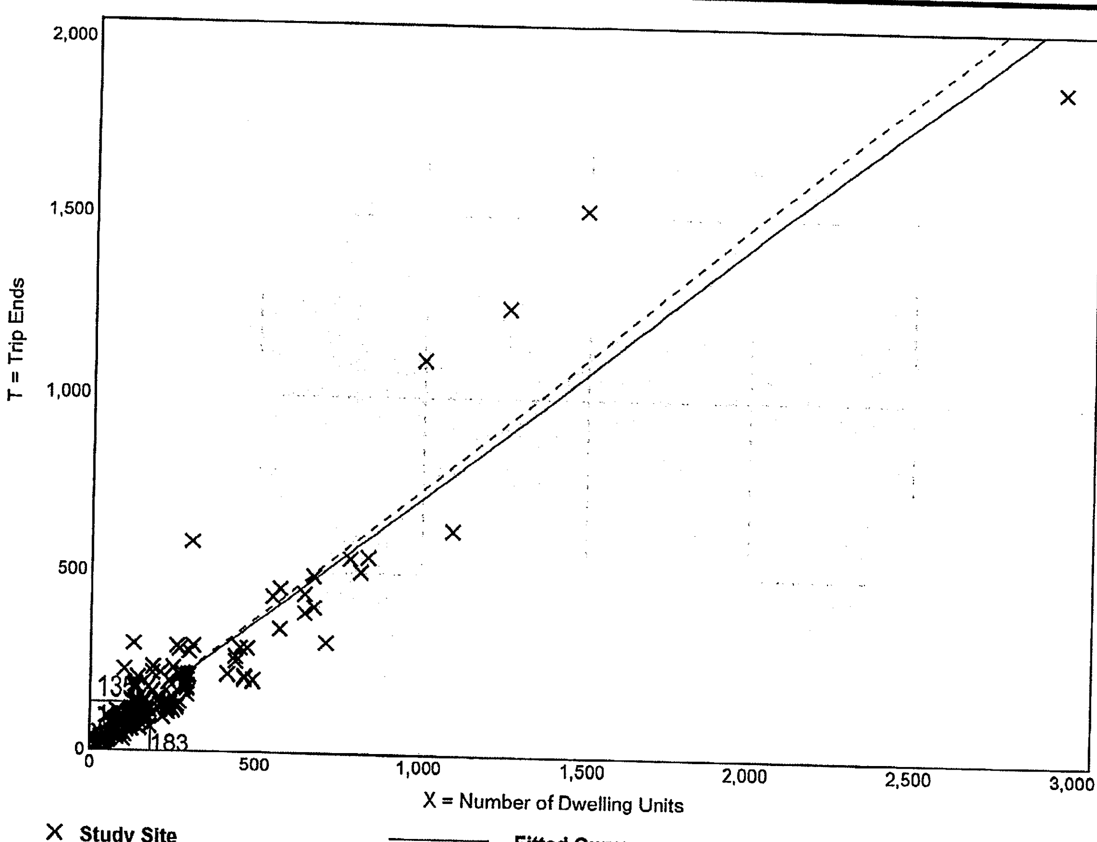
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.**
Setting/Location:	**General Urban/Suburban**
Number of Studies:	173
Avg. Num. of Dwelling Units:	219
Directional Distribution:	25% entering, 75% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.74	0.33 - 2.27	0.27

Data Plot and Equation



Fitted Curve Equation: T = 0.71(X) + 4.80

R^2= 0.89

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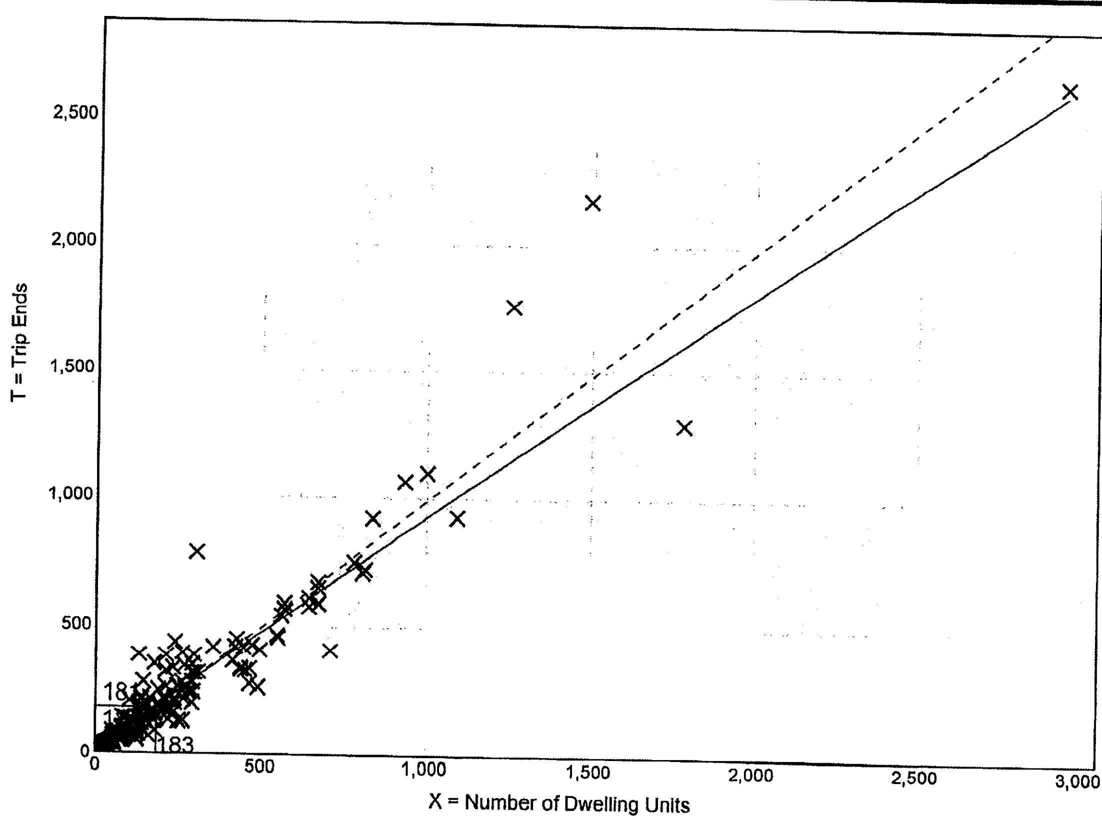
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 190
Avg. Num. of Dwelling Units: 242
Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.99	0.44 - 2.98	0.31

Data Plot and Equation



× **Study Site** ——— **Fitted Curve** - - - - **Average Rate**

Fitted Curve Equation: Ln(T) = 0.96 Ln(X) + 0.20

R^2= 0.92

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Single-Family Detached Housing
(210)

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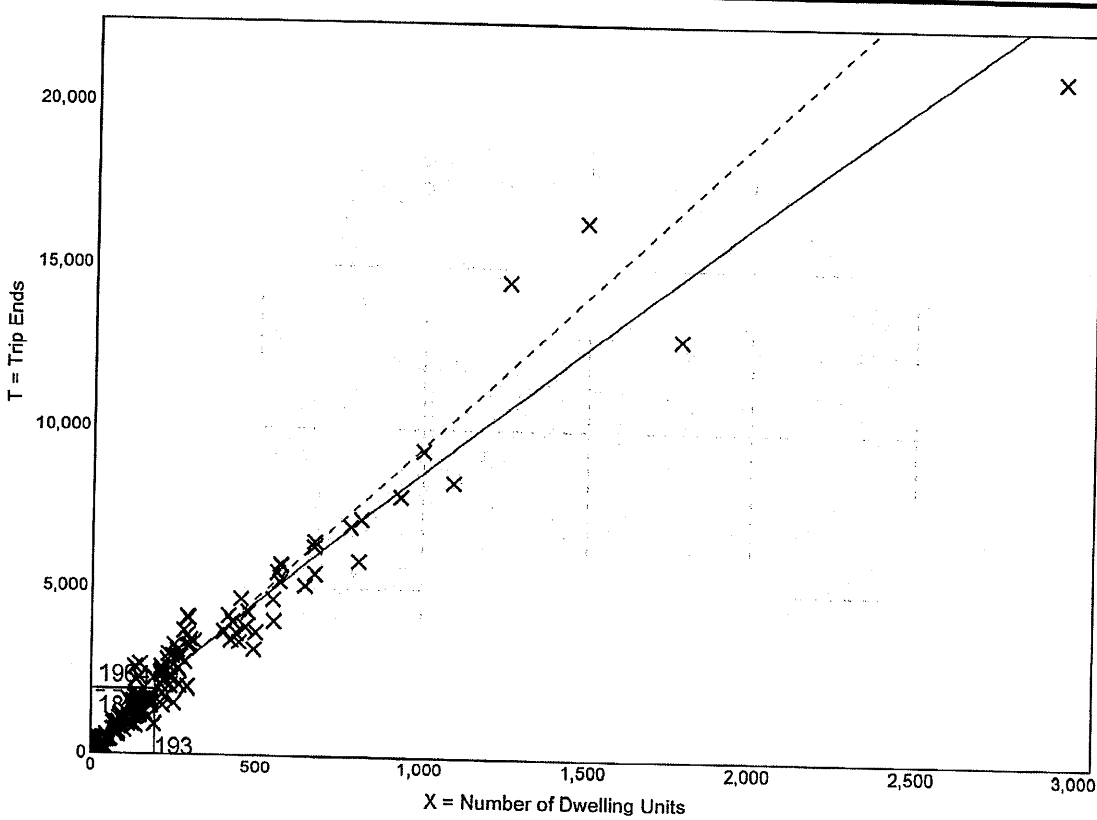

× **Study Site** —— **Fitted Curve** - - - - **Average Rate**

Fitted Curve Equation: Ln(T) = 0.92 Ln(X) + 2.71

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Trip Gen Manual, 10th Edition • Institute of Transportation Engineers

Single-Family Detached Housing
(210)

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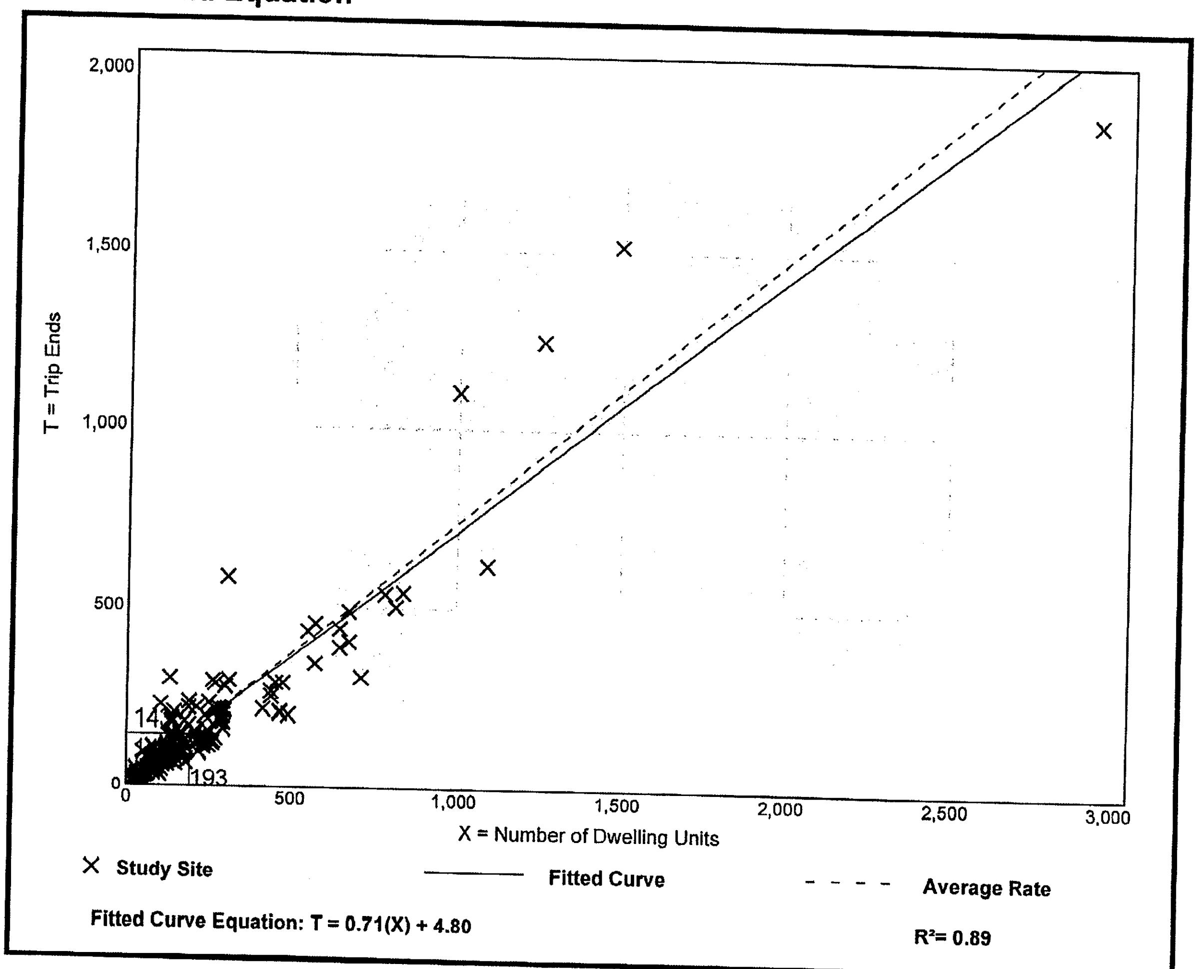

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Single-Family Detached Housing
(210)

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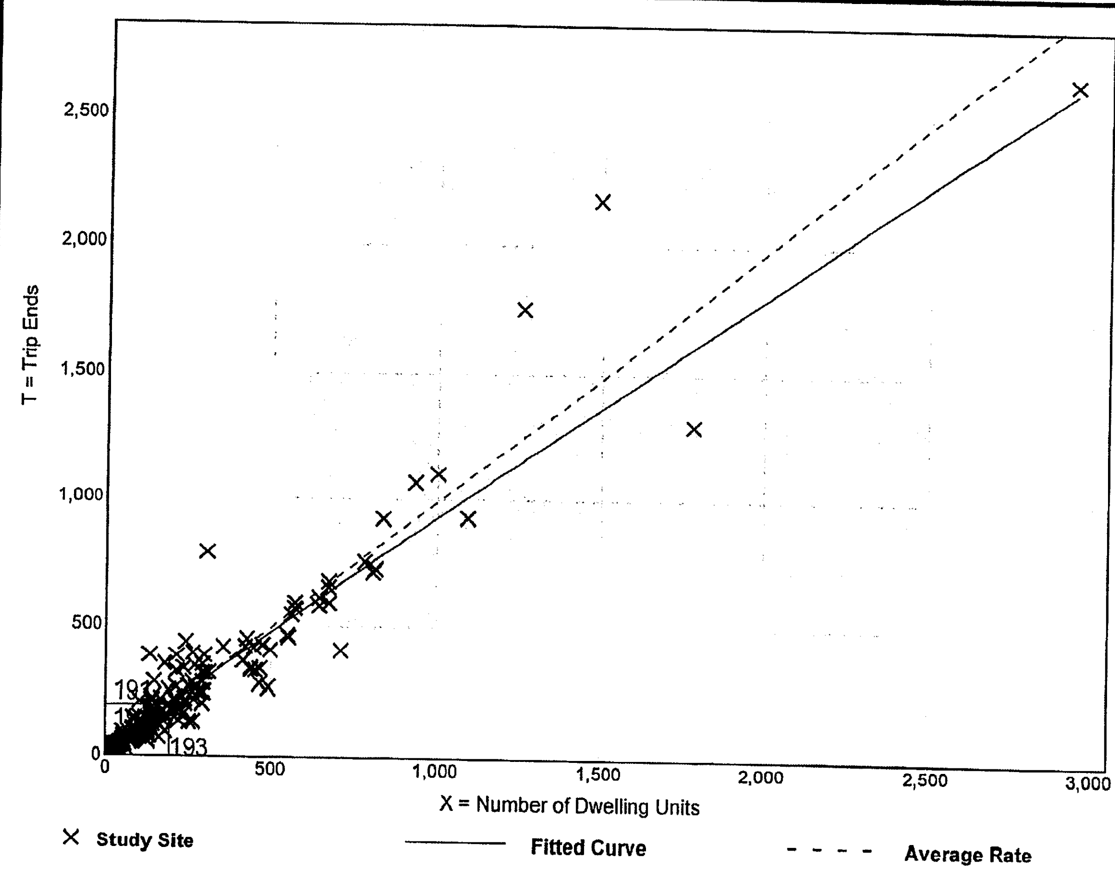
Data Plot and Equation



Fitted Curve Equation: $\ln(T) = 0.96 \ln(X) + 0.20$

R^2= 0.92

Trip Gen Manual, 10th Edition • Institute of Transportation Engineers

MASTER SANITARY SEWER REPORT

PIONEER MEADOWS
Phase II

Prepared for:

Lennar Reno, LLC
10345 Professional Circle, Ste. 100
Reno, NV 89521
(775) 789-3233

Prepared by:

Wood Rodgers, Inc.
1361 Corporate Blvd.
Reno, NV 89502
(775) 823-4068

PROFESSIONAL ENGINEER - STATE OF NEVADA
ASHLEY N. VERLING
Exp: 06/30/20
CIVIL
No. 024779

6/18/2020

July, 2008
Revised: January, 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

I. INTRODUCTION

This report presents the findings of a detailed evaluation of the sewer systems at and within the proposed Phase 2 of the Pioneer Meadows Master Planned Community. The objective of this study is to establish sewer peak flow rates for use as the basis of design of the sewer collection system and for determination of impacts to existing sewer mainlines (Northwest Interceptor) within the Spanish Springs Valley in northeastern Sparks, Nevada.

Since this report was originally written, several of the villages and roadways have final approved plans and are either constructed or under construction. This revision is being provided to update the original report with revised design information to match the final improvement plans, updated unit counts, and zoning. The single-family dwelling count has been updated to reflect changes to Villages 5, 6, and 10. These changes include: the removal of the school site from Village 5, an addition of 10 lots to Village 6 where the existing park site was located, and the inclusion of the lots within Village 10 which are being constructed as single-family as opposed to multi-family per the handbook. In addition, the multi-family unit count has been updated to remove the Village 10 units and to match the final unit count proposed by the final design plans for Villages 11 and 12. Lastly, the 88 acre business park sewer calculation has been revised from General Commercial to Business Park per the current zoning.

II. GENERAL INFORMATION

A. Site Location and Description

The Pioneer Meadows Phase 2 site is described as being within Section 11, Township 20 North, Range 20 East. Pioneer Meadows Phase 2 is located west of the Wingfield Springs Master Planned Community and north of Vista Boulevard within the Spanish Springs Valley, northeast Sparks, Washoe County, Nevada. The site's location relative to the Reno/Sparks area is shown on **Figure 1**. A more detailed view of the site is illustrated on **Figure 2**.

Pioneer Meadows Phase 2 will consist of approximately 494 Single-Family residential units, 561 Multi-Family units, 88 acres of Business Park, and any necessary civil improvements and amenities on approximately 270 acres. The zonings are based on those outlined in the planning booklet entitled *PIONEER MEADOWS, Application for a Planned Community in the City of Sparks, Nevada, Development Standards Handbook*, approved by the City Council of the City of Sparks on July 7, 1999, final draft, October 12, 2000, and amended September 12, 2016.

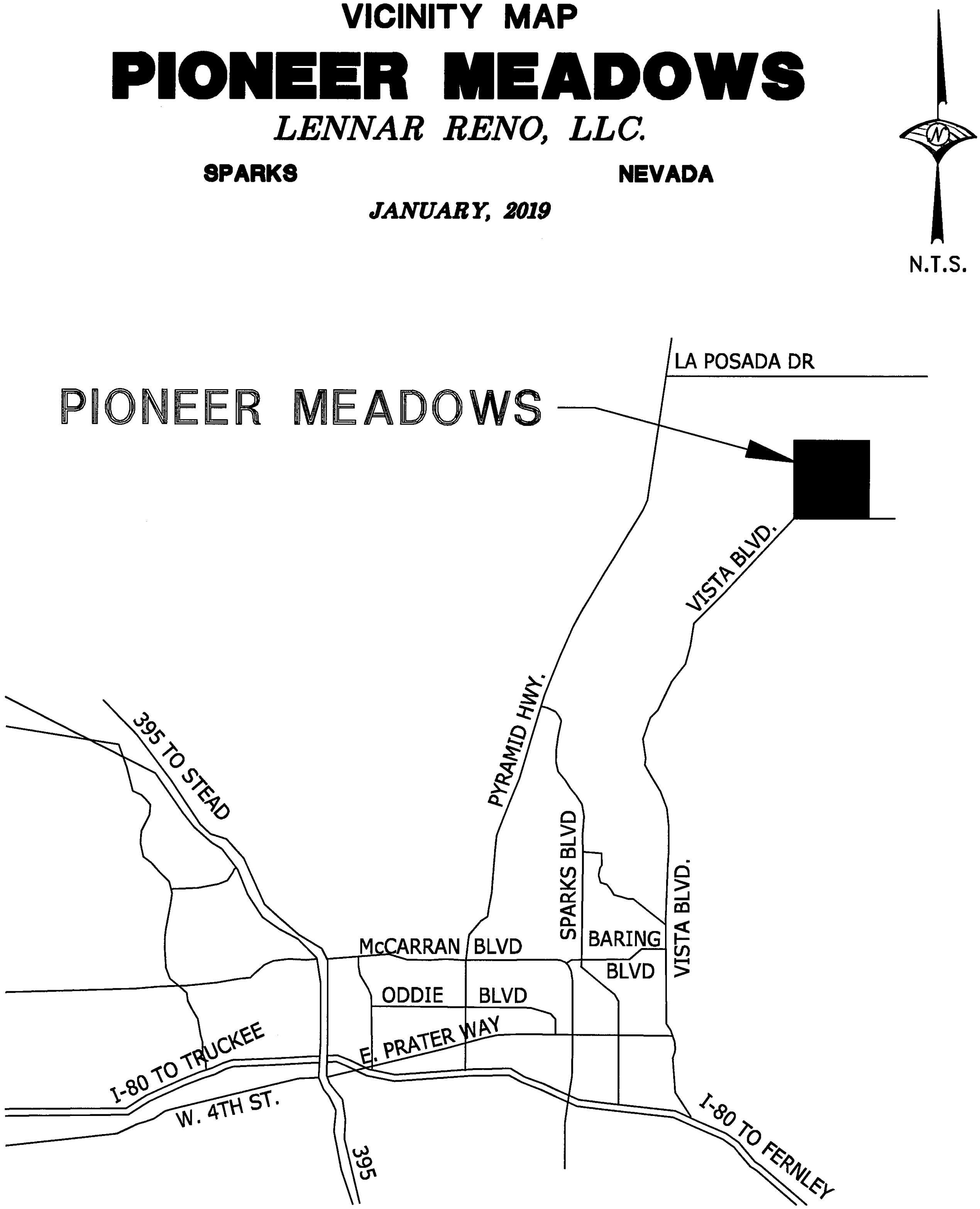
VICINITY MAP

PIONEER MEADOWS

LENNAR RENO, LLC.

SPARKS **NEVADA**

JANUARY, 2019



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Reno, NV 89502 Fax 775.823.4066

FIGURE 1

J:\Jobs\1509_PioneerMeadows\Pioneer Meadows-OA\Civil\Studies\Sewer\20190111_PM_SewerReport_Rev\PM_SS_VICMAP.dwg 1/22/19 8:19am kcastle

PHASE II SANITARY SEWER MAP

PIONEER MEADOWS

LENNAR RENO, LLC.

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JANUARY, 2019

N.T.S.

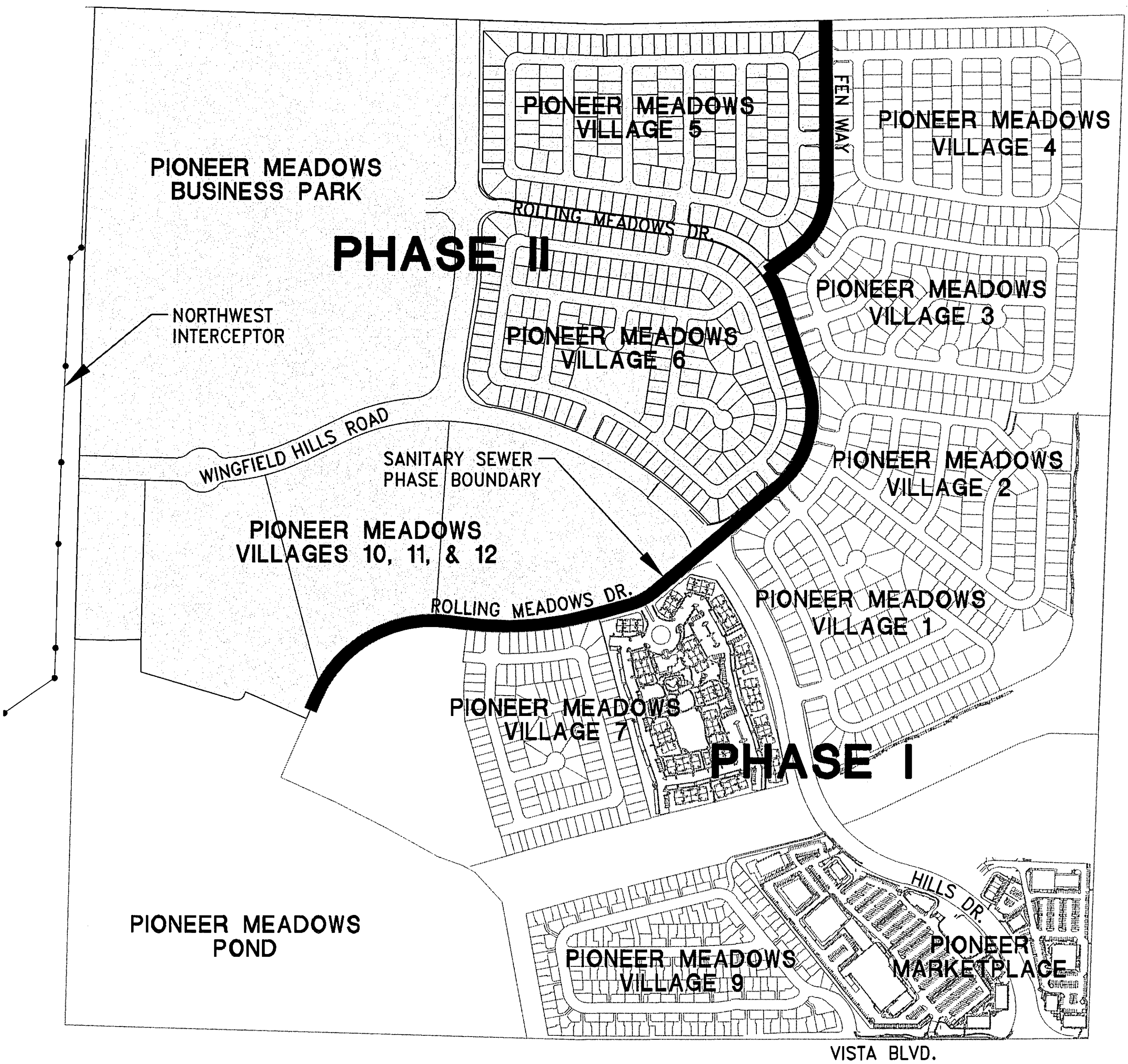

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FIGURE 2

J:\Jobs\1509_PioneerMeadows\Pioneer Meadows V5\Planning\Studies\Sewer\PM_SS_PHASINGMAP.dwg 1/11/19 9:45am kcastle

B. Background Information

The Northwest Interceptor currently exists along the western boundary of the Pioneer Meadows site on the Kiley Ranch Property. The interceptor collects sewage flows from portions of the Spanish Springs Valley and transports them to the Sparks Sewer Main. The *Northwest Sanitary Sewer Interceptor Extension Final Sewer report* Prepared for the City of Sparks by Amec dated May 2002 (hereinafter referred to as the facilities plan) was used as a guideline for existing flows in the line to determine the amount of flow the line will handle from the Pioneer Meadows site. According the facilities plan, the Northwest interceptor was sized to accommodate 1.61 MGD from the Pioneer Meadows Development.

III. PROPOSED SEWAGE FLOW RATES

As previously mentioned, "The Facilities Plan" was used as a guideline for existing flows in the line to determine the amount of flow the line will handle from the Pioneer Meadows site. In order to be consistent with the Facilities Plan, sewage rates and peaking factors for the various zonings in the area were used per **Table 1** below:

TABLE 1 – WASTEWATER FLOW RATES

Land Use	Average Daily Flow	Peaking Factor
Hotel/Resort	170 gpd per room	2.0
Commercial District	3,333 gal/acre/day	2.0
Business Park/Public Facility	1,100 gal/acre/day	2.0
School	6,000 gal/day	2.0
Residential	325 gpd/du	2.0

* gpd=gallons per day, gal=gallons, du=dwelling unit

The total outflow from the Pioneer Meadows site inside the Phase 2 boundary was determined using the parameters in Table 1, and are tabulated in Table 2:

TABLE 2 – PIONEER MEADOWS WASTEWATER FLOW RATES

Land Use	Total Dwelling Units or Acres	Equivalent Dwelling Units (EDU's)	Average Daily Flow	Peaking Factor	Total Flows (gpd)
Single Family Residential	494 du	494	325 gpd/du	2.0	321,100
Multi Family	37.4 acres	561	325 gpd/du	2.0	364,650
Business Park	88 acres	299	1,100 gal/acre/day	2.0	193,600
Total		**1,354**			**879,350**

IV. HYDRAULIC ANALYSIS OF ONSITE SEWER

Each section of the onsite sewer line was analyzed to assure that minimum velocity and flow depth requirements were met. The hydraulic calculations are included in **Appendix I** and **Figure 3 Node map 1** pipe layout and manholes for the Northern portion of Phase 2. The Northern portion of Phase 2 includes Village 5, Village 6, and the Business Park. Generally, the line is 8" in diameter and runs at minimum slope of 0.2% in Wingfield Hills Road where peak flows will maintain approx. 2ft/sec velocities. As less area is contributing to the remaining pipes in Village 6 and Village 5, a minimum pipe slope of 0.4% was used. A pipe network analysis is included in the appendix of this report which details the pipe slopes, Velocities, and Peak flow rates for the key junction points shown in Node Map 1.

The southern portion of the Pioneer Meadows Phase 2 Sanitary Sewer analysis includes the single-family Village 10, and multi-family Villages 11 and 12. The layout shown on **Figure 4 Node map 2** in **Appendix II** for these villages was a preliminary layout used to determine the maximum allowable discharges to pipes throughout the villages. Since this report was originally completed, Villages 10, 11, and 12 have been designed and a more detailed sewer study has been completed by Odyssey Engineering Incorporated titled "Updated Master Sewer Report – Pioneer Meadows Villages 10-12" originally dated June 2017 and updated in August 2018. The final design report for Villages 10, 11, and 12 should be referenced with respect to the sewer design of those villages. All calculations in reference to Villages 10, 11, and 12 have been removed from this report.

V. EXISTING NORTHWEST INTERCEPTOR

The Northwest Interceptor accepts sewage flow from areas north and west of the proposed Phase 2 of the Pioneer Meadows Master Planned Community site and carries them south and west toward Sparks Boulevard. According to the Facilities plan, the Pioneer Meadows Phase 2 peak sewer flows are approximately 1.61 MGD. The Peak flows calculated in this report are approx 0.88 MGD which is well below the 1.61 MGD the northwest interceptor was designed to accommodate from this development.

VI. CONCLUSION

This report presents the findings of a detailed evaluation of the sewage outflows from the Pioneer Meadows Phase 2 site, and presents hydraulic calculations to assure that the existing infrastructure has the capacity to service this portion of Pioneer Meadows. The maps and supporting hydraulic calculations show that the Northwest Interceptor is equipped to handle the flows, and therefore service the Pioneer Meadows Phase 2 site.

VII. REFERENCES

Haestad Methods, Inc. (1994). *FlowMaster v8i.* Prepared by: Haestad Methods, Inc. Copyright 1994-2003.

City of Sparks (1995). *Wasterwater Facilities Plan and Environmental Assessment.* Prepared for: City of Sparks, by: Pyramid Engineers in association with Roy H. Hibdon, Civil Engineering Consultants, Ltd., January 13, 1995.

City of Sparks (2000). *PIONEER MEADOWS – Application for a Planned Community in the City Sparks, Nevada – Development Standards Handbook.* Council Approved – July 7, 1999, Final – October 12, 2000, and Amended September 12, 2016.

City of Sparks (2002). *Northwest Sanitary Sewer Interceptor Extension Final Sewer report.*
Prepared for: City of Sparks, by: Amec, May 2002.

Updated Master Sewer Report – Pioneer Meadows Villages 10-12 Prepared for: Lennar Reno, LLC, by: Odyssey Engineering Incorporated, Updated August 2018.

APPENDIX I

Phase 2 Northern Portion Node Map 1
Haested Methods Circular Pipe Report
Haested Methods Individual Pipe Worksheets
Tabular Pipe Network Summary

NODE MAP 1

PIONEER MEADOWS

PHASE 2 MASTER SANITARY SEWER REPORT

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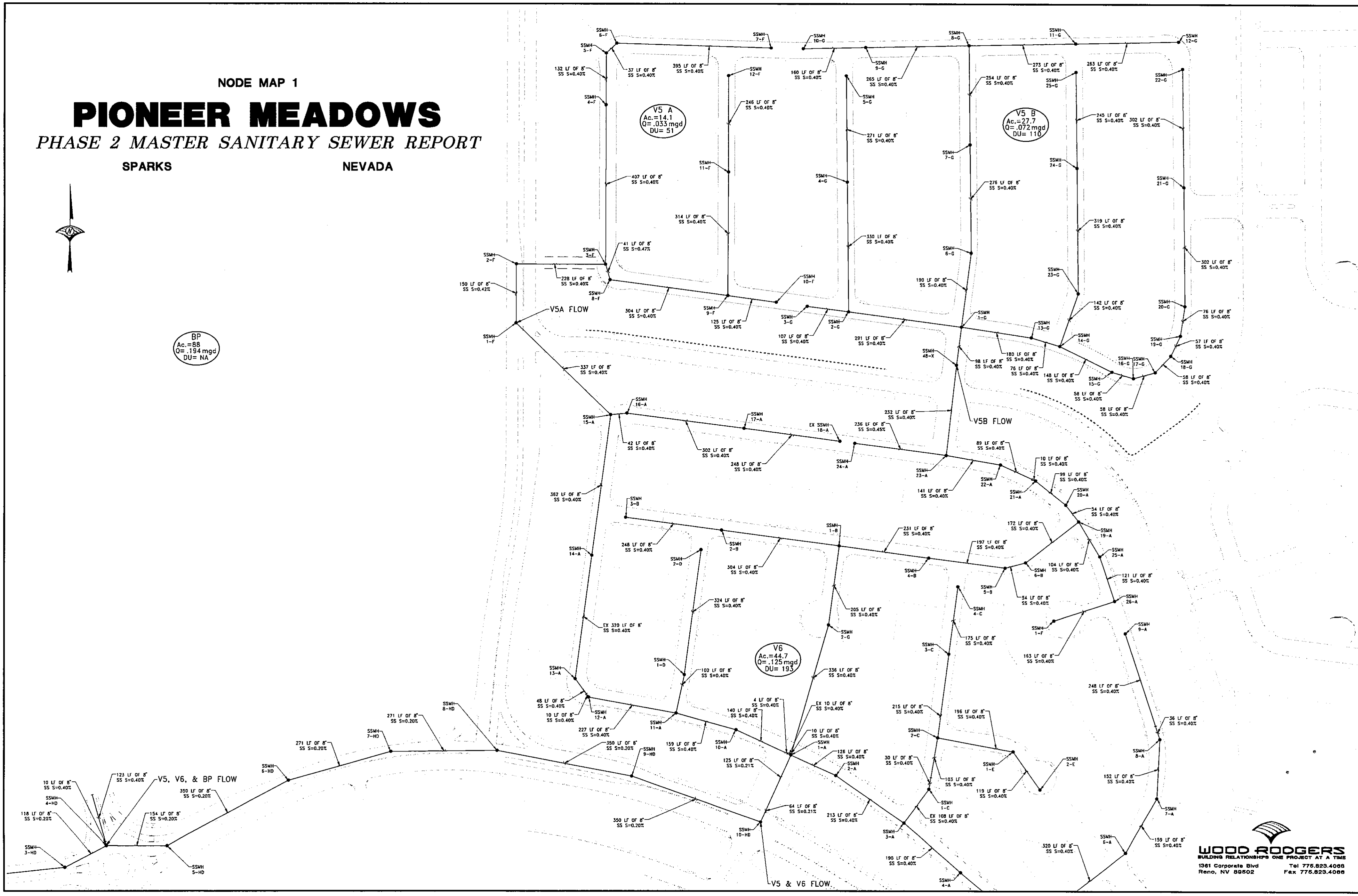


Haested Methods Circular Pipe Report

Label	Roughness Coefficient	Channel Slope (%)	Normal Depth (ft)	Diameter (in)	Discharge (gal/day)	Flow Area (ft^2)	Wetted Perimeter (ft)	Percent Full (%)	Velocity (ft/s)	Maximum Discharge (gal/day)	Discharge Full (gal/day)
V5A FLOW	0.010	0.40	0.10	8.00	33,000	0.03	0.54	15.4	1.50	690,723	642,112
V5B FLOW	0.010	0.40	0.15	8.00	72,000	0.06	0.66	22.6	1.88	690,723	642,112
V5 & V6 FLOW	0.010	0.20	0.33	8.00	230,000	0.18	1.05	50.4	2.02	488,415	454,041
BP, V5, & V6 FLOW	0.010	0.20	0.51	8.00	424,000	0.29	1.47	76.6	2.29	488,415	454,041

Worksheet for V5A FLOW

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.40000	%
Diameter	8.00	in
Discharge	33000.000	gal/day

Results

Normal Depth	1.23	in
Flow Area	0.03	ft²
Wetted Perimeter	0.54	ft
Hydraulic Radius	0.76	in
Top Width	0.48	ft
Critical Depth	0.10	ft
Percent Full	15.4	%
Critical Slope	0.00407	ft/ft
Velocity	1.50	ft/s
Velocity Head	0.03	ft
Specific Energy	0.14	ft
Froude Number	0.99	
Maximum Discharge	1.07	ft³/s
Discharge Full	0.99	ft³/s
Slope Full	0.00001	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	15.41	%
Downstream Velocity	Infinity	ft/s

Worksheet for V5B FLOW

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.40000	%
Diameter	8.00	in
Discharge	72000.000	gal/day

Results

Normal Depth	1.81	in
Flow Area	0.06	ft²
Wetted Perimeter	0.66	ft
Hydraulic Radius	1.08	in
Top Width	0.56	ft
Critical Depth	0.15	ft
Percent Full	22.6	%
Critical Slope	0.00384	ft/ft
Velocity	1.88	ft/s
Velocity Head	0.05	ft
Specific Energy	0.21	ft
Froude Number	1.02	
Maximum Discharge	1.07	ft³/s
Discharge Full	0.99	ft³/s
Slope Full	0.00005	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	22.62	%
Downstream Velocity	Infinity	ft/s

Worksheet for V5 & V6 FLOW

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.20000	%
Diameter	8.00	in
Discharge	230000.000	gal/day

Results

Normal Depth	4.03	in
Flow Area	0.18	ft^2
Wetted Perimeter	1.05	ft
Hydraulic Radius	2.01	in
Top Width	0.67	ft
Critical Depth	0.28	ft
Percent Full	50.4	%
Critical Slope	0.00392	ft/ft
Velocity	2.02	ft/s
Velocity Head	0.06	ft
Specific Energy	0.40	ft
Froude Number	0.69	
Maximum Discharge	488415.04	gal/day
Discharge Full	454041.44	gal/day
Slope Full	0.00051	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	50.37	%
Downstream Velocity	Infinity	ft/s

Worksheet for BP, V5, & V6 FLOW

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.20000	%
Diameter	8.00	in
Discharge	424000.000	gal/day

Results

Normal Depth	0.51	ft
Flow Area	0.29	ft²
Wetted Perimeter	1.42	ft
Hydraulic Radius	0.20	ft
Top Width	0.56	ft
Critical Depth	0.38	ft
Percent Full	76.6	%
Critical Slope	0.00447	ft/ft
Velocity	2.29	ft/s
Velocity Head	0.08	ft
Specific Energy	0.59	ft
Froude Number	0.57	
Maximum Discharge	488415.04	gal/day
Discharge Full	454041.44	gal/day
Slope Full	0.00174	ft/ft
Flow Type	SubCritical	

GVF Input Data

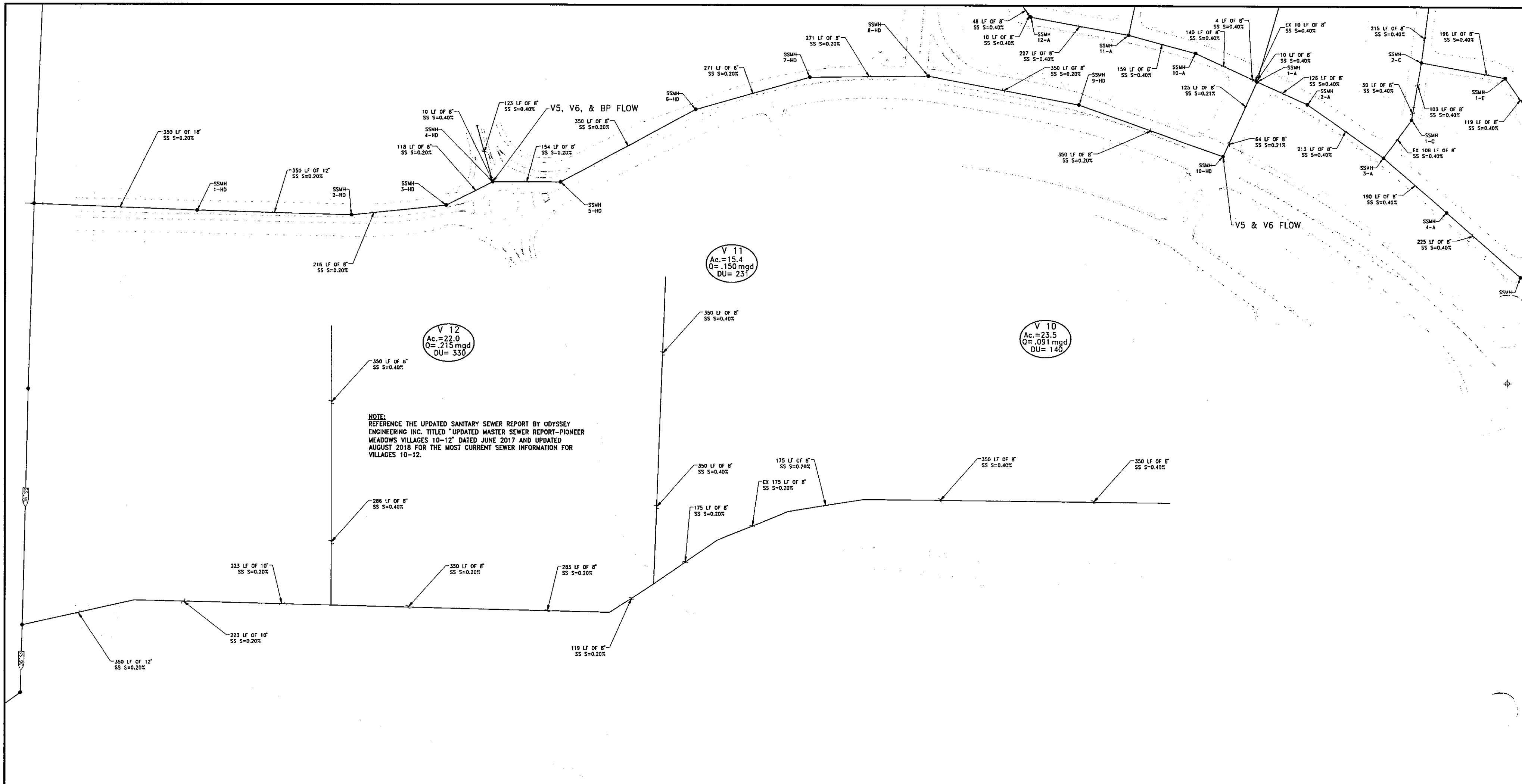
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	76.59	%
Downstream Velocity	Infinity	ft/s

APPENDIX II

Phase 2 Northern Portion Node Map 2
Haested Methods Individual Pipe Worksheets:
8" Pipe @ 0.4% - Maximum Discharge
8" Pipe @ 0.2%/2ft/sec - Minimum Discharge
8" Pipe @ 0.2% - Maximum Discharge
12" Pipe @ 0.2% - Maximum Discharge
12" Pipe @ 0.2%/2ft/sec - Minimum Discharge
18" Pipe @ 0.2% - Maximum Discharge
18" Pipe @ 0.2%/2ft/sec - Minimum Discharge



NODE MAP 2

PIONEER MEADOWS

PHASE 2 MASTER SANITARY SEWER REPORT

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Reno, NV 89502 Fax 775.823.4068

Worksheet for 8" Pipe @ 0.4%- Maximum Discharge

Project Description

Friction Method	Manning Formula		
Solve For	Discharge		

Input Data

Roughness Coefficient		0.010	
Channel Slope		0.40000	%
Normal Depth		4.00	in
Diameter		8.00	in

Results

Discharge		321055.780	gal/day
Flow Area		0.17	ft²
Wetted Perimeter		1.05	ft
Hydraulic Radius		2.00	in
Top Width		0.67	ft
Critical Depth		0.33	ft
Percent Full		50.0	%
Critical Slope		0.00414	ft/ft
Velocity		2.85	ft/s
Velocity Head		0.13	ft
Specific Energy		0.46	ft
Froude Number		0.98	
Maximum Discharge		1.07	ft³/s
Discharge Full		0.99	ft³/s
Slope Full		0.00100	ft/ft
Flow Type	SubCritical		

GVF Input Data

Downstream Depth		0.00	in
Length		0.00	ft
Number Of Steps		0	

GVF Output Data

Upstream Depth		0.00	in
Profile Description			
Profile Headloss		0.00	ft
Average End Depth Over Rise		0.00	%
Normal Depth Over Rise		50.00	%
Downstream Velocity		Infinity	ft/s

Worksheet for 8" Pipe @ 0.2%/2ft/sec- Minimum Discharge

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.20000	%
Diameter	8.00	in
Discharge	220000.000	gal/day

Results

Normal Depth	3.93	in
Flow Area	0.17	ft²
Wetted Perimeter	1.03	ft
Hydraulic Radius	1.98	in
Top Width	0.67	ft
Critical Depth	0.27	ft
Percent Full	49.1	%
Critical Slope	0.00391	ft/ft
Velocity	2.00	ft/s
Velocity Head	0.06	ft
Specific Energy	0.39	ft
Froude Number	0.70	
Maximum Discharge	0.76	ft³/s
Discharge Full	0.70	ft³/s
Slope Full	0.00047	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	49.07	%
Downstream Velocity	Infinity	ft/s

Worksheet for 8" Pipe @ 0.2%- Maximum Discharge

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.20000	%
Normal Depth	6.40	in
Diameter	8.00	in

Results

Discharge	443810.469	gal/day
Flow Area	0.30	ft²
Wetted Perimeter	1.48	ft
Hydraulic Radius	2.43	in
Top Width	0.53	ft
Critical Depth	0.39	ft
Percent Full	80.0	%
Critical Slope	0.00455	ft/ft
Velocity	2.29	ft/s
Velocity Head	0.08	ft
Specific Energy	0.62	ft
Froude Number	0.54	
Maximum Discharge	0.76	ft³/s
Discharge Full	0.70	ft³/s
Slope Full	0.00191	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	80.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for 12" Pipe @ 0.2%- Maximum Discharge

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.20000	%
Normal Depth	9.60	in
Diameter	12.00	in

Results

Discharge	1308501.525	gal/day
Flow Area	0.67	ft²
Wetted Perimeter	2.21	ft
Hydraulic Radius	3.65	in
Top Width	0.80	ft
Critical Depth	0.61	ft
Percent Full	80.0	%
Critical Slope	0.00408	ft/ft
Velocity	3.01	ft/s
Velocity Head	0.14	ft
Specific Energy	0.94	ft
Froude Number	0.58	
Maximum Discharge	2.23	ft³/s
Discharge Full	2.07	ft³/s
Slope Full	0.00191	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	80.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for 12" Pipe @ 0.2%/2ft/sec- Minimum Discharge

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.20000	%
Diameter	12.00	in
Discharge	242000.000	gal/day

Results

Normal Depth	3.46	in
Flow Area	0.19	ft²
Wetted Perimeter	1.13	ft
Hydraulic Radius	1.98	in
Top Width	0.91	ft
Critical Depth	0.25	ft
Percent Full	28.8	%
Critical Slope	0.00334	ft/ft
Velocity	2.00	ft/s
Velocity Head	0.06	ft
Specific Energy	0.35	ft
Froude Number	0.78	
Maximum Discharge	2.23	ft³/s
Discharge Full	2.07	ft³/s
Slope Full	0.00007	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	28.81	%
Downstream Velocity	Infinity	ft/s

Worksheet for 18" Pipe @ 0.2%- Maximum Discharge

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.20000	%
Normal Depth	14.40	in
Diameter	18.00	in

Results

Discharge	3857899.625	gal/day
Flow Area	1.52	ft^2
Wetted Perimeter	3.32	ft
Hydraulic Radius	5.48	in
Top Width	1.20	ft
Critical Depth	0.94	ft
Percent Full	80.0	%
Critical Slope	0.00367	ft/ft
Velocity	3.94	ft/s
Velocity Head	0.24	ft
Specific Energy	1.44	ft
Froude Number	0.62	
Maximum Discharge	6.57	ft^3/s
Discharge Full	6.11	ft^3/s
Slope Full	0.00191	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	80.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for 18" Pipe @ 0.2%/2ft/sec- Minimum Discharge

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.20000	%
Diameter	18.00	in
Discharge	280000.000	gal/day

Results

Normal Depth	3.25	in
Flow Area	0.22	ft^2
Wetted Perimeter	1.32	ft
Hydraulic Radius	1.98	in
Top Width	1.15	ft
Critical Depth	0.24	ft
Percent Full	18.0	%
Critical Slope	0.00309	ft/ft
Velocity	2.00	ft/s
Velocity Head	0.06	ft
Specific Energy	0.33	ft
Froude Number	0.81	
Maximum Discharge	6.57	ft^3/s
Discharge Full	6.11	ft^3/s
Slope Full	0.00001	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	18.03	%
Downstream Velocity	Infinity	ft/s

TECHNICAL DRAINAGE REPORT

PIONEER MEADOWS
VILLAGE 6

Prepared for:

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Revised
July 18, 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

TABLE OF CONTENTS

INTRODUCTION

The Pioneer Meadows Village 6 subdivision is located in Spanish Springs Valley, Section 11, Township 20 North, and Range 20 East within the City of Sparks, Nevada, Sphere of Influence. The Pioneer Meadows Village 6 subdivision is bordered by existing Pioneer Meadows Villages 1, 2, & 3 to the east, future Pioneer Meadows Village 5 site to the north, future Pioneer Meadows Business Park to the west, and future Pioneer Meadows Village 10 to the south. A vicinity map is included in Appendix A of this report for reference.

This revision is being provided to update the original report with revised design information to match the final improvement plans and updated unit counts. The 2.54 acre park site originally located in Village 6 has been removed and replaced with 10 additional single family lots. In addition, the school site in Village 5 has been removed from the exhibits to reflect the updated zoning for that village.

The eastern portion of the existing site was previously graded with the Mass Grading Plans for *Pioneer Meadows Phase 2 Villages 5 and 6* prepared by Wood Rodgers, Inc. Per those plans, the site slopes in a southwest direction at about 0.4%. The remaining western portion of the site along with the remainder of the Pioneer Meadows development was previously graded with the *Pioneer Meadows Borrow Pit and Mass Grading* plans prepared by Wood Rodgers, Inc. Per those plans, the site slopes in a southwest direction at about 0.4%. The existing surface and subsurface conditions were tested by Wood Rodgers, Inc. and are reported in the *Geotechnical Update Report for Pioneer Meadows Village 6,* dated February 2012.

The proposed development consists of 193 - 6,000± sq. ft. single-family residential lots and 1.24± acres of common area for a total project area of 44.71± acres to be built in multiple phases. This report includes the final storm drain system analysis for all four phases of Village 6. Each phase will be designed to function independently from any future phase of Village 6 while also being designed to accommodate the runoff from future phases. This report will require updates as each phase is designed for roadway design and surface water flow may be refined with each upcoming phase.

Currently the site drains to the existing drainage channel along the southern side of Wingfield Hills Road. This existing drainage channel is conveyed into existing dual 5'x3' box culverts located at the intersection of Wingfield Hills Road and Rolling Meadows Drive. Flows from these existing box culverts are then conveyed via a roadside channel to the existing major drainage channel which runs from the northeastern corner of the project to the existing detention basin located in the southwest corner of the Pioneer Meadows project area. This detention basin has been sized to accommodate the post development flows from this phase of Pioneer Meadows. The basin is discussed in further detail in the *Pioneer Meadows Drainage Master Plan Addendum* dated April 15, 2003, prepared by WRC Nevada, Inc. This information was also included in the *Pioneer Meadows Phase 1, Conditional Letter of Map Revision Request* dated May 22, 2003, prepared by WRC Nevada, Inc., which was reviewed and accepted by the City of Sparks and FEMA.

The purpose of this report is to demonstrate that the internal drainage system for Pioneer Meadows Village 6 complies with the criteria set forth in the *Truckee Meadows Regional Drainage Manual*. Since the detention basin (Pioneer Meadows Pond) in the southwest corner of Pioneer Meadows has been sized to accommodate the post development flows for the entire project, detention will not be discussed in this report.

HISTORIC DRAINAGE

The historic drainage condition for Pioneer Meadows Village 6 has been discussed in the studies listed above. Currently the entire site slopes in a southwest direction at about 0.4%. Along the southern side of Wingfield Hills Road is a channel that collects the runoff from the eastern portion of Phase 6 and conveys it through existing dual 5'x3' box culverts at the intersection of Wingfield Hills Road and Rolling Meadows Drive. From the box culverts, drainage is conveyed by channel systems to the Pioneer Meadows Pond in the southwest corner of Pioneer Meadows. The existing drainage channels and box culverts have been sized to accommodate the flows from Pioneer Meadows Village 6. Analysis of these existing drainage channels and box culverts are included in the *Pioneer Meadows Master Drainage Plan* prepared by WRC Nevada, Inc., dated May 24, 2002 and a supplemental analysis has been included in this report in appendix A of this report.

PROPOSED DRAINAGE SYSTEM

The proposed drainage system will collect the runoff from the lots in drainage swales that direct flow to the curb and gutter network in the streets where catch basins intercept the flow and convey the runoff through pipe networks to the drainage channel along the southern side of Wingfield Hills Road.

There are three separate networks within Pioneer Meadows Village 6, one of the networks conveys storm water to an existing storm drain system located in Rolling Meadows Drive at the intersection of Abbotswood Drive. A 12" pipe stub was constructed at the intersection of Rolling Meadows and Abbotswood Drive with a non-pressurized flow capacity of 1.8 cfs. The 5yr peak flow from Pioneer Meadows Village 6 at this location is 1.9 cfs while the 100yr peak flow is 6.6 cfs. At this intersection the 5yr peak will be conveyed within the pipe network and the 100 yr will be conveyed in both the pipe network and in the street.

The second pipe network will convey storm water to a channel (Channel CH-5) along the southern side of Wingfield Hills Road where it will be conveyed southeast to the intersection of Wingfield Hills Road and Rolling Meadows. At this intersection an existing 5'x3' box culvert will convey the flows thru the intersection and to an existing channel (Channel CH-6 & CH-7) along the south western side of Wingfield Hills Road. The pipe network layout can be found on the Drainage Basin Map included in Appendix A of this report. The map shows each storm drain line and the corresponding inlets. Additionally, a Storm Drain System Schematic has been included in Appendix A to more clearly show the storm drain layout.

The third pipe network will convey storm water off of the Village 6 site into a future storm drain network located in the future roadway running along the western boundary of the project. This storm drain network will convey the flow through a network located in Wingfield Hills Road to the Reach 9 box culverts where it will be discharged. These basins (W-6, W-7, and W-8) are analyzed in more detail in the *Technical Drainage Report for Wingfield Hills Road Phase 2* by Wood Rodgers, Inc.

Appendices B and C provide information on how the storm drain system will convey the 5-year and 100-year storms. Additionally, storm drain profiles are included in each Appendix to show the hydraulic grade lines for the pipe systems in the 5-year and 100-year storms. The storm drain system is designed to intercept the 5-year storm event and carry it completely within the pipe network until it discharges into an existing pipe system. The 100-year storm event is carried both within the pipe network and in the street where overland release is achieved at low points located at the western and southern sides of the project.

A future road and business park borders the project to the west, Wingfield Hills Road and future Pioneer Meadows Village 10 to the south. These areas drain away from Pioneer Meadows Village 6 and are not analyzed in this report.

Flows from a portion of the future Pioneer Meadows Village 5, portions of existing Pioneer Meadows Village 3, and portions of existing Rolling Meadows Drive north and east of the site drain through Pioneer Meadows Village 6 and have been included in the design of the Village 6 storm drain system. No other offsite flows contribute to the Pioneer Meadows Village 6 storm drain system.

The Hydrologic Basin Map located in Appendix A shows all onsite and offsite drainage basins contributing to the projects storm drain system. Basins 1 through 33 contribute to catch basins that will be constructed with Village 6. Basins FW1 through FW7 contribute to an existing storm drain pipe network located in Fen Way and Rolling Meadows Drive that will be connected to the Village 6 storm drain pipe network. Basin V5 (S-1) is the large basin located north of Village 6 that accounts for portions of the future Village 5. These flows will be intercepted by the Village 6 storm drain pipe network and will then be conveyed through the site and discharged into the existing drainage channel located south of Wingfield Hills Road (Channel CH-5).

The existing Channel CH-5 was sized in the original WRC study to have a design capacity of 156 cfs with 1' of freeboard. In this report the 100yr Peak flow was calculated to be approximately 140 cfs. The existing Channel design was analyzed with the 140 cfs flow and the freeboard was calculated to be 0.93'. The Flowmaster detailed reports are included in the end of Appendix A of this report. Once a final lot layout and design is determined for the future Village 5, Basin V5 will be divided into smaller sub-basins. A more detailed sub-basin layout and time of concentration calculations will likely generate a lower Q_5 and Q_{100} when compared to the large Basin V5 that is used in this report which will in turn lower the peak flows contributing to this channel.

Sediment transport and erosion will be controlled through outlet and inlet protection, slope stabilization with riprap or vegetation, and through conformance to the Storm Water Pollution Prevention Plan (SWPPP) that has been prepared for this site. The SWPPP includes Best Management Practices (BMPs), a maintenance schedule, and a list of the responsible parties for maintenance to insure the storm drain system operates correctly to prevent excessive sediment transport. (See Appendix A for riprap sizing calculations and detail).

HYDROLOGIC AND HYDRAULIC ANALYSIS

The Rational Method (Q=CIA) was used for all runoff computations for peak discharges as outlined in Section 704 of the *Truckee Meadows Regional Drainage Manual.* The Rational Equation requires a runoff coefficient, intensity, and an area to determine the flow at each inlet location. Indirectly the rational equation also requires a time of concentration. This time of concentration is used to determine the intensity.

Determining "I":
Figure 601 of the Drainage Manual was first used to determine which region the project is located in. Since the project falls in Region 1 Table 601 (see Appendix A) was utilized. It lists the storm intensities as a function of storm event and time of concentration. A time of concentration of 10 minutes was assumed for each sub-basin since the sub-basins are all relatively small. The intensity for each sub-basin was then acquired from the listed values in table 601 for both a 5 and 100-year storm event. A time of concentration was calculated based on Initial Overland and Channelized Flow, and another based on Urbanized Basin flows. The lesser of these two time of concentrations was chosen. Calculations are outlined in the Modified Form 2 spreadsheets under Appendices B and C. These time of concentrations along with intensities from Table 601 were used to calculate actual intensities for each sub-basin.

Determining "C":

The runoff coefficients were taken from table 701 (see Appendix A) of the Drainage Manual for Residential 1/8-acre lots (~6,000 sq. ft.) for both the 5 and 100-year storm events.

Determining "A":
Areas for each sub-basin were determined from tracing polylines along sub-basin boundaries and listing the polyline properties to obtain the area.

Section 304.4 of the Drainage Manual stipulates the requirements for flooding of streets. For the minor storm event a local street must maintain a 12-foot dry centered travel lane with a maximum velocity times depth of 6 sf/sec. For a major storm event the street may be flooded from R/W to R/W with a maximum velocity times depth of 8 sf/sec and a maximum depth of one foot at gutter flowline. Inlets were located in the subdivision at critical points to preserve the flooding requirements for the respective storm events. To analyze the maximum street capacity, a maximum depth of flow and velocity of flow was calculated using FlowMaster version 7.0 for an irregular channel (1/2 street section) for both events. The flattest street section has a street slope of 0.40%. The maximum allowable ½ street flows were calculated for the minor storm event to be $Q_5 = 5.0$ cfs and $v_5 = 2.1$ fps. For the major storm event, they were calculated to be $Q_{100} =$ 18.6 cfs, and $v_{100} = 2.7$ fps

All inlets in sag have been designed to allow for overland release at a depth of approximately 0.6' ensuring no lots flood in the event a catch basin clogs. At the western side of the site, depth of flow will reach approximately 0.4' above gutter flow line. If the catch basin clogs flow will head west through the common area and out into the future Lazy 5 Parkway along the west side of Village 6. The future road will drain south towards Wingfield Hills Road. The storm drain system constructed with Wingfield Hills Road will collect the flows and convey them to a roadside channel which will convey the flows to the Reach 9 along the west property line of Pioneer Meadows, per the *Pioneer Meadows Master Drainage Plan* & the Phase II CLOMR. Most of the Village 6 site overland release flow will be collected and conveyed by the street curb and gutter to the south entrance of the project and into the drainage channel located on the southwest side of Wingfield Hills Road. All flows ultimately drain to the pond located at the southwest corner of the Pioneer Meadows property.

The pipe network was modeled in StormCAD Version V8i and requirements from section 900 of the *Truckee Meadows Regional Drainage Manual* were utilized. In order to create an accurate model the flows from each sub-basin calculated using the rational method were entered along with locations, elevations, and friction losses of the catch basins, pipes, manholes, and outlets. Since pipe sizing is an iterative process, an initial size for each pipe is first estimated and the model is run. Then each pipe size is adjusted and the program is run again. This process is repeated until a pipe network is created that complies with all regulations governing the project. In addition to the pipe sizing analysis, StormCAD also calculates the following elements of the system: inlet capture efficiency, pipe capacities, velocities, and the hydraulic grade line. StormCAD also provides flow rates and velocities at outlets so outlet protection can be appropriately sized based on Section 807.3 of the Manual. Reference Appendices B & C for StormCAD pipe, inlet, and junction reports for the 5 and 100-year storm events, respectively.

The capture efficiency and performance of inlets was calculated from orifice and weir equations based on in-sump and on-grade conditions. The *Neenah Catalogue* was used to determine the physical properties of each inlet type. This information was also entered into StormCAD to create a more efficient storm model.

StormCAD Map Legend:

Size – Size of pipe input into StormCAD model
Area – Area of basin contributing to inlet
Q_{total} – Total amount of flow to inlet based on Q=CiA
$Q_{bypassed}$ – Amount of flow bypassed from inlet (StormCAD only bypasses flows if inlet is specified as being 'on-grade' as opposed to being in a 'sump' condition)
$Q_{intercepted}$ – Amount of flow intercepted into inlet (If the inlet is 'on-grade' then this amount is the Q_{total} minus $Q_{bypassed}$. If the inlet is in 'sump' then StormCAD assumes all Q_{total} is intercepted in to the inlet)
$Q_{capacity}$ - Flow capacity of the pipe based on full flow capacity, not pressurized flow capacity. (The $Q_{capacity}$ should be higher if the flow is pressurized but StormCAD does not account for this)
Q_{system} - Total amount of flow within pipe assuming all inlets connected to the system intercept all flows being directed to them
$Q_{total\ system}$ – Total system flow at outlet location (StormCAD assumes all flows are intercepted by the system, it does not account for overland flows)

The storm drain system has been designed to accommodate both the 5 and 100-year storm events as described above. The existing drainage systems surrounding Pioneer Meadows Village 6 dictate the outlet elevations for the subdivision storm network. The pipes shown on the hydrologic basin map are more than adequate for the 5-year storm event. However, using non-pressurized flow analysis the system is not sized for the 100-year storm event to be conveyed within the pipe system. Therefore, in the analysis process it was assumed that the streets would fill up at inlet sump locations without flowing onto the adjacent lots. This will allow head to build up which will create pressurized flow in the pipe. Under this pressure, the pipe network along with street capacity can adequately convey the 100-year storm event. Profiles and schematics of the entire storm drain system have been included in Appendices B and C.

VILLAGE 6 – PHASE 1A INTERIM CONDITION

Pioneer Meadows Village 6 will be constructed in multiple phases. The storm drain system to be constructed with Phase 1A is designed to accommodate Phase 1A independently from the future phases of the Village 6 storm drain system. A portion of the storm drain system proposed with Phase 1A will drain into the existing storm drain pipe network located in Rolling Meadows Drive east of the site. This 12" pipe at the intersection of Rolling Meadows and Abbotswood Drive was sized to accommodate flows from the proposed connection. The other Village 6 – Phase 1A storm drain pipe network will collect and convey storm flows to a temporary 24" outlet located at the intersection of Marcus Way and Wild River Way. Flows from this 24" outlet are intercepted by a temporary ditch that will convey flows to the existing channel located south of Wingfield Hills Road. Reference the Hydrologic Basin Map and ditch calculations located in Appendix A.

CATCH BASIN BYPASS AND OVERLAND RELEASE ANALYSIS

HGL_{100}'s above top of pipe indicate pressurized flow. HGL_{100}'s above the street finish grade indicates overflow from the storm drain system into street but does not indicate depth of flow in the street. A conservative estimate of flow in the street was obtained by using StormCAD to iteratively adjust the amount of flow entering some catch basins to obtain an HGL_{100} at finish grade, then assuming excess flows are conveyed in the street.

The HGL_{100} is above the street finish grade in some areas along the larger storm drain system located in Pioneer Meadows Village 6. Limited by cover and pipe crossing clearances, pipe sizes could not be increased in these areas. To determine what the pipe system's capacity is under pressure with no excess flows in the street, flow to catch basins were adjusted to force the HGL_{100} to be equal with the estimated overland flow or ponding depth at the catch basin. The spreadsheet titled "100-Year Storm Adjusted Area and Flow Table" is located under Appendix D and illustrates the adjusted catch basin flows. The 100-year profiles in Appendix C reflect the adjusted conditions to account for overland release due to catch basin bypass.

According to this methodology, if only the adjusted flows are entering the catch basins, the remainder of the flows will be conveyed by the street to the low points located at the southern sides of the project. Once flows reach the southern low point, they will flow into the drainage channel located along the southwest side of Wingfield Hills Road. The figure titled "Overland Release Flow Map" in Appendix D illustrates where overland flows accumulate and flow throughout the Pioneer Meadows Village 6 site. The standard street section can be flooded from R/W to R/W in a 100-yr storm event, which at 0.40% will allow 37.27 cfs to be carried within the street. The "Overland Release Flow Map" shows no flows above that allowable street capacity.

In conclusion, flows will be adequately conveyed by the storm drain network when combined with the capacity of the street. Figures and calculations located in Appendix D summarize the results of this section.

FLOOD HAZARD AREAS

The project site has recently been included in a FEMA approved LOMR. Per Case No.: 09-09-748P, dated April 28, 2009, the project site is located entirely in Flood Zone X. Zone X is defined by FEMA as, "Areas determined to be outside the 0.2% annual chance floodplain." A copy of the LOMR, which includes the revised FEMA FIRM Map #32031C3052G, is included in the Appendix of this report with the subject site delineated.

CONCLUSIONS

The proposed drainage system for Pioneer Meadows Village 6 has been designed to adequately collect, convey, and discharge the 5 and 100-year storm events. It has also been designed in compliance with all *Truckee Meadows Regional Drainage Manual* policies and requirements, State and Federal Regulations, and Flood Hazard Regulations. Erosion control measures have also been incorporated to reduce the amount of existing sedimentation.

REFERENCES

Geotechnical Update Report for Pioneer Meadows Village 6, February 2012, Wood Rodgers, Inc.

Neenah Foundry Company Construction Castings Catalog "R" 11th Edition, 1989.

Pioneer Meadows Master Drainage Plan Addendum, April 15, 2003, WRC Nevada, Inc.

Pioneer Meadows Phase 1, Conditional Letter of Map Revision Request, May 22, 2003, WRC Nevada, Inc.

Request for Conditional Letter of Map Revision (CLOMR) for Pioneer Meadows Phase II, May 12, 2006, Manhard Consulting, Ltd.

Bentley StormCAD V8i, Haestad Methods, Inc.

Truckee Meadows Regional Drainage Manual, April 30, 2009.

Appendix A – Drainage Report Figures

Vicinity Map
Hydrologic Basin Map
Storm Drain System Schematic
Table 601 & Table 701
Riprap Sizing Calculation Sheet
Outlet Protection Detail
LOMR: Case No. 09-09-0748P
Village 6 – Phase 1 Temporary Cutoff Ditch
CH-5 Capacity Calculations

VICINITY MAP

PIONEER MEADOWS VILLAGE 6

LENNAR RENO, LLC.

SPARKS **NEVADA**

JULY, 2019

500' 250' 0 500' 1000'

SCALE: 1" = 500'

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CITY OF SPARKS
RAINFALL DEPTH - DURATION - FREQUENCY DATA
REGION 1

DEPTH (inches)

Return Period (Yr.)	5 min	10 min	15 min	30 min	1 hr	2 hr	3 hr	6 hr	12 hr	24 hr
2 yr	0.11	0.16	0.20	0.27	0.33	0.44	0.52	0.70	0.88	1.06
5 yr	0.15	0.22	0.27	0.37	0.45	0.59	0.69	0.91	1.13	1.36
10 yr	0.19	0.28	0.34	0.47	0.57	0.72	0.83	1.06	1.33	1.59
25 yr	0.25	0.38	0.46	0.63	0.77	0.92	1.03	1.27	1.58	1.90
50 yr	0.32	0.47	0.58	0.79	0.96	1.10	1.21	1.43	1.78	2.13
100 yr	0.39	0.59	0.72	0.98	1.19	1.31	1.40	1.58	1.97	2.35

INTENSITY (in/hr)

Return Period (Yr.)	5 min	10 min	15 min	30 min	1 hr	2 hr	3 hr	6 hr	12 hr	24 hr
2 yr	1.31	0.97	0.79	0.54	0.33	0.22	0.17	0.12	0.07	0.04
5 yr	1.78	1.32	1.08	0.74	0.45	0.29	0.23	0.15	0.09	0.06
10 yr	2.25	1.67	1.36	0.93	0.57	0.36	0.28	0.18	0.11	0.07
25 yr	3.03	2.25	1.84	1.26	0.77	0.46	0.34	0.21	0.13	0.08
50 yr	3.80	2.82	2.30	1.57	0.96	0.55	0.40	0.24	0.15	0.09
100 yr	4.73	3.51	2.87	1.96	1.19	0.66	0.47	0.26	0.16	0.10

RATIONAL FORMULA METHOD RUNOFF COEFFICIENTS

Land Use or Surface Characteristics	Aver. % Impervious Area	Runoff Coefficients 5-Year (C_5)	Runoff Coefficients 100-Year (C_{100})
Business/Commercial:			
Downtown Areas	85	.82	.85
Neighborhood Areas	70	.65	.80
Residential:			
(Average Lot Size)			
⅛ Acre or Less (Multi-Unit)	65	.60	.78
¼ Acre	38	.50	.65
⅛ Acre	30	.45	.60
½ Acre	25	.40	.55
1 Acre	20	.35	.50
Industrial:	72	.68	.82
Open Space:			
(Lawns, Parks, Golf Courses)	5	.05	.30
Undeveloped Areas:			
Range	0	.20	.50
Forest	0	.05	.30
Streets/Roads:			
Paved	100	.88	.93
Gravel	20	.25	.50
Drives/Walks:	95	.87	.90
Roof:	90	.85	.87

Notes:

1. Composite runoff coefficients shown for Residential, Industrial, and Business/Commercial Areas assume irrigated grass landscaping for all pervious areas. For development with landscaping other than irrigated grass, the designer must develop project specific composite runoff coefficients from the surface characteristics presented in this table.

WOOD RODGERS
ENGINEERING • PLANNING • MAPPING • SURVEYING

Designed By: MAD
8/25/2008

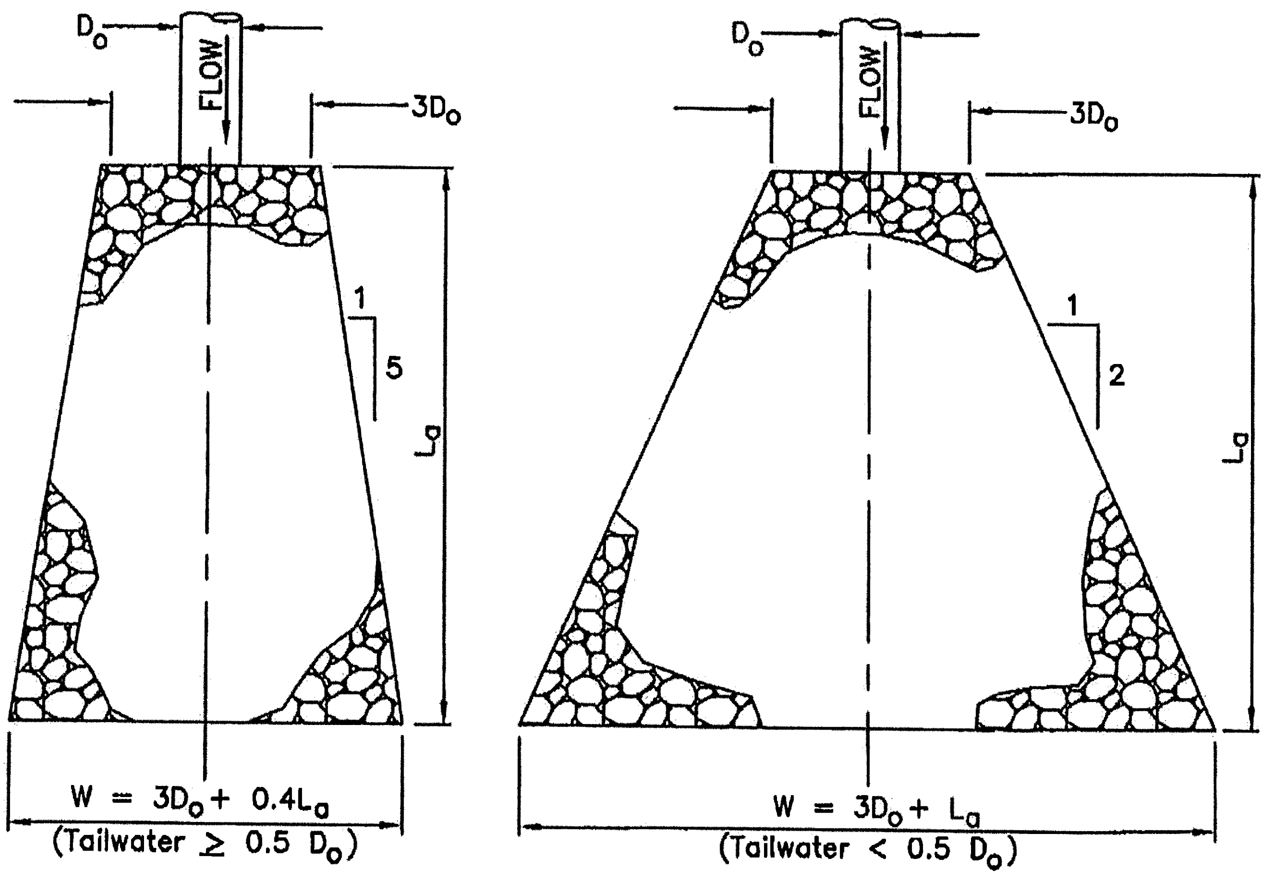
PROJECT: PIONEER MEADOWS VILLAGE 6

Outlet Protection--Rock Rip Rap Sizing

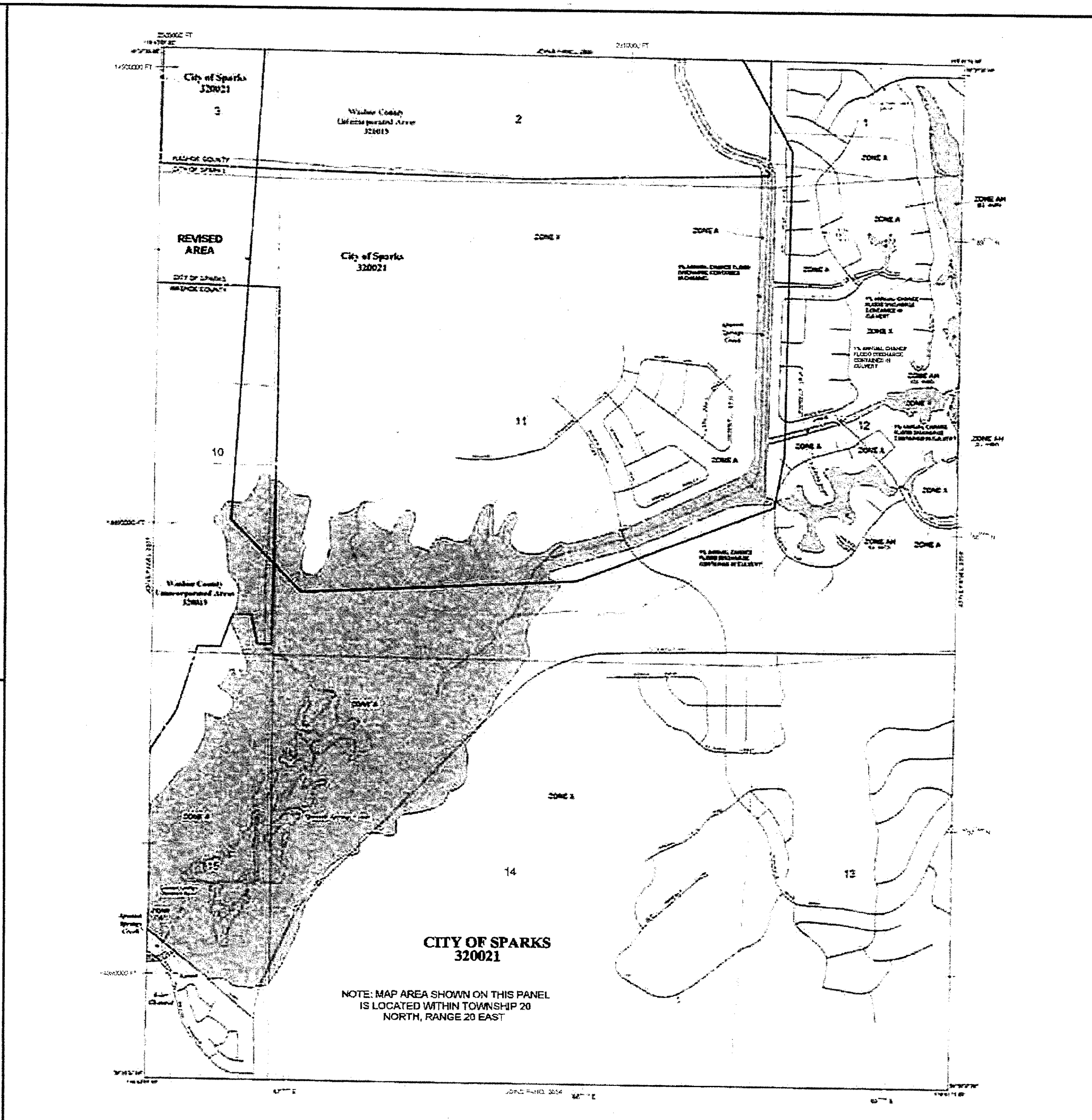
CULVERT	Q100 cfs	Do ft	Vo fps	TW ft	Do/2 ft	La ft	W ft	d50 ft	d50 in	BEDDING DEPTH (ft)	RIPRAP CLASS	FAN SHAPE
V6 OUTLET*	161.15	4.79	9.01	4.50	2.40	79.65	46.23	0.48	5.79	1.00	USE CLASS 150	CONFIGURATION 1
P-F2-F1	24.48	2.00	7.79	2.00	1.00	39.96	21.99	0.28	3.38	1.00	USE CLASS 150	CONFIGURATION 1

*For calculation purposes, the 6'x3' box culvert outlet area has been converted to a circular section of equal area.
6 x 3 = 18 sq ft
pi x (4.79/2)^2 = 18 sq ft

CONFIGURATION OF CULVERT OUTLET PROTECTION



NOTES TO USERS



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

ZONE A

ZONE AE

ZONE AH

ZONE AO

ZONE AR

ZONE A99

ZONE V

ZONE VE

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X

OTHER AREAS

ZONE X

ZONE D

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

MAP SCALE 1" = 500'

PANEL 3052G

FIRM
FLOOD INSURANCE RATE MAP

WASHOE COUNTY,
NEVADA
AND INCORPORATED AREAS

PANEL 3052 OF 3475

MAP NUMBER
32031C3052G

MAP REVISED
MARCH 16, 2009

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

Legend

1% annual chance (100-Year) Floodplain

1% annual chance (100-Year) Floodway

0.2% annual chance (500-Year) Floodplain

MAP SCALE 1" = 1000'

500 0 1000 FEET

300 0 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2865G

FIRM

FLOOD INSURANCE RATE MAP

WASHOE COUNTY,

NEVADA

AND INCORPORATED AREAS

PANEL 2865 OF 3475

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
WASHOE COUNTY	320019	2865	G
SPARKS, CITY OF	320021	2865	G

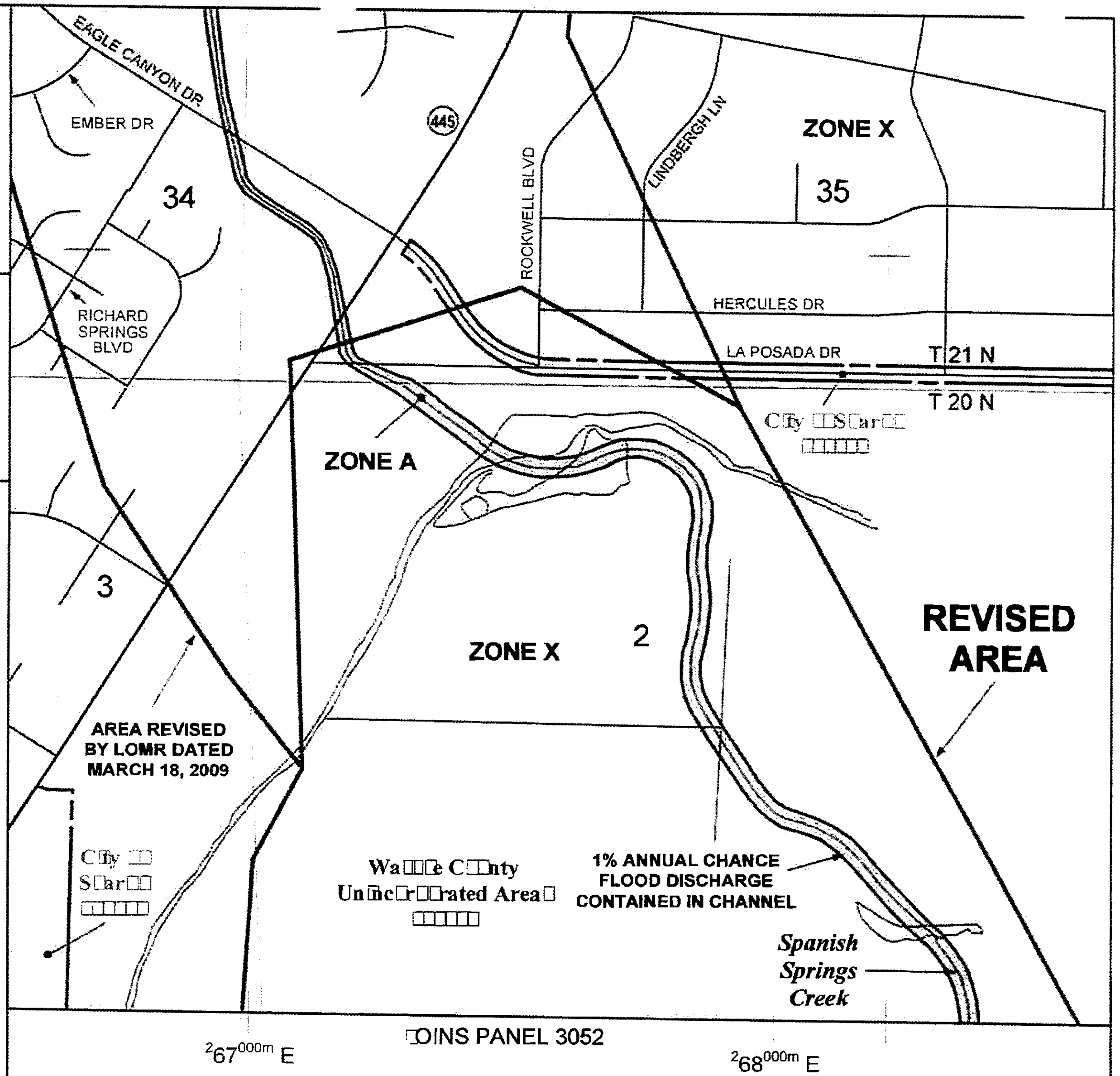
REVISED TO
REFLECT LOMR
EFFECTIVE: April 28, 2009

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
32031C2865G

MAP REVISED
MARCH 16, 2009

Federal Emergency Management Agency



Page 1 of 4	Issue Date: April 28, 2009	Effective Date: April 28, 2009	Case No.: 09-09-0748P	LOMR-APP

Follows Conditional Case No.: 06-09-B475R

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	City of Sparks Washoe County Nevada COMMUNITY NO.: 320021	CHANNELIZATION GRADING	HYDRAULIC ANALYSIS HYDROLOGIC ANALYSIS NEW TOPOGRAPHIC DATA
IDENTIFIER	Stonebrook	APPROXIMATE LATITUDE & LONGITUDE: 36.629, -119.704 SOURCE: USGS QUADRANGLE DATUM: NAD 83	

ANNOTATED MAPPING ENCLOSURES	ANNOTATED STUDY ENCLOSURES
TYPE: FIRM* NO.: 32031C2865 G DATE: March 16, 2009 TYPE: FIRM NO.: 32031C3052 G DATE: March 16, 2009	NO REVISION TO THE FLOOD INSURANCE STUDY REPORT

Enclosures reflect changes to flooding sources affected by this revision.
* FIRM - Flood Insurance Rate Map; ** FBFM - Flood Boundary and Floodway Map; *** FHBM - Flood Hazard Boundary Map

FLOODING SOURCE(S) & REVISED REACH(ES)

Spanish Springs Creek – from approximately 4,800 feet upstream of the Spanish Springs Detention Basin to approximately 100 feet downstream of State Highway 445

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
Spanish Springs Creek	Zone AO (Depth 1)	Zone A (contained)	NONE	YES
	Zone A	Zone A (contained)	YES	YES
	Zone AO (Depth 1)	Zone X (unshaded)	YES	YES

* BFEs - Base Flood Elevations

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www fema.gov/nfip.

Dahlia Kasperski, P.E., CFM, Program Specialist
Engineering Management Branch
Mitigation Directorate

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

NFIP regulations Subparagraph 60.3(b)(7) requires communities to ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management ordinances; therefore, responsibility for maintenance of the altered or relocated watercourse, including any related appurtenances such as bridges, culverts, and other drainage structures, rests with your community. We may request that your community submit a description and schedule of maintenance activities necessary to ensure this requirement.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance discharges computed in the submitted hydrologic model. Future development of projects upstream could cause increased discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on discharges and could, therefore, indicate that greater flood hazards exist in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Dahlia Kasperski

Dahlia Kasperski, P.E., CFM, Program Specialist
Engineering Management Branch
Mitigation Directorate

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Sally M. Ziolkowski
Director, Mitigation Division
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, CA 94607-4052
(510) 627-7175

STATUS OF THE COMMUNITY NFIP MAPS

We will not physically revise and republish the FIRM for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panel(s) warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

Although the area of revision is shown on the effective FIRM as within the unincorporated areas of Washoe County, this entire area has been annexed by the City of Sparks.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip

Dahlia Kasperski, P.E., CFM, Program Specialist
Engineering Management Branch
Mitigation Directorate

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

This revision is effective as of the date of this letter. Any requests to review or alter this determination should be made within 30 days and must be based on scientific or technical data.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304 Additional Information about the NFIP is available on our website at http://www fema gov/nfip.

Dahlia Kasperski, P.E., CFM, Program Specialist
Engineering Management Branch
Mitigation Directorate

Village 6 - Phase 1 Temporary Cutoff Ditch
Worksheet for Triangular Channel

Project Description	
Worksheet	Village 6 Phase 1 Temporary Cut
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

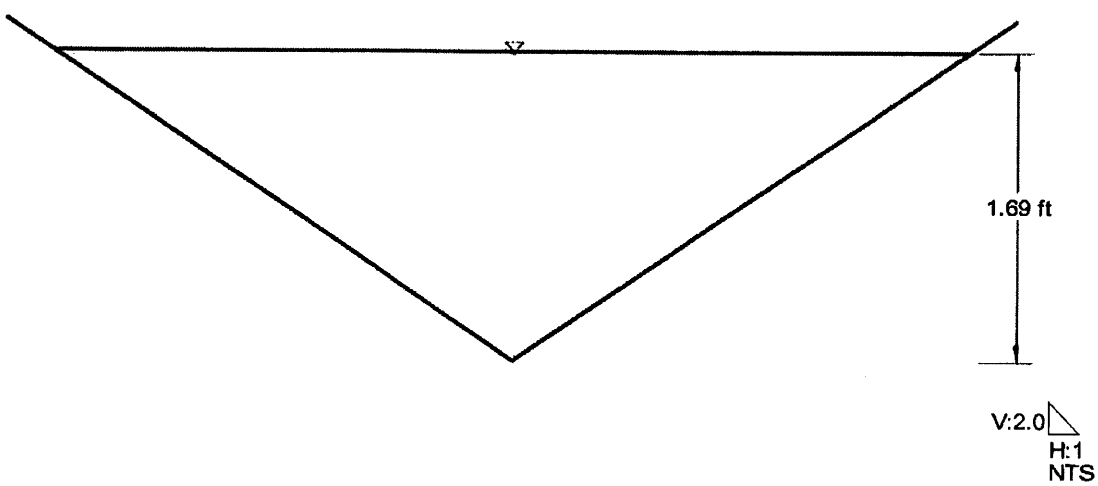
Input Data		
Mannings Coeffic	0.030	
Channel Slope	004500	ft/ft
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Discharge	24.50	cfs

Results		
Depth	1.69	ft
Flow Area	8.5	ft²
Wetted Perim	10.68	ft
Top Width	10.13	ft
Critical Depth	1.33	ft
Critical Slope	0.016125	ft/ft
Velocity	2.87	ft/s
Velocity Head	0.13	ft
Specific Energ	1.82	ft
Froude Numb	0.55	
Flow Type	Subcritical	

Village 6 - Phase 1 Temporary Cutoff Ditch
Cross Section for Triangular Channel

Project Description	
Worksheet	Village 6 Phase 1 Temporary Cut
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coeffic	0.030	
Channel Slope	004500	ft/ft
Depth	1.69	ft
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Discharge	24.50	cfs



Worksheet
Worksheet for Trapezoidal Channel

Project Description	
Project File	y:\current projects\3077-barker homes\chnl-rev.fm2
Worksheet	CH-5
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.002500 ft/ft	
Depth	3.00	ft
Left Side Slope	3.000000 H : V	
Right Side Slope	3.000000 H : V	
Bottom Width	7.00	ft

Results		
Discharge	153.44	cfs
Flow Area	48.00	ft²
Wetted Perimeter	25.97	ft
Top Width	25.00	ft
Critical Depth	1.88	ft
Critical Slope	0.017092 ft/ft	
Velocity	3.20	ft/s
Velocity Head	0.16	ft
Specific Energy	3.16	ft
Froude Number	0.41	
Flow is subcritical.		

Notes:

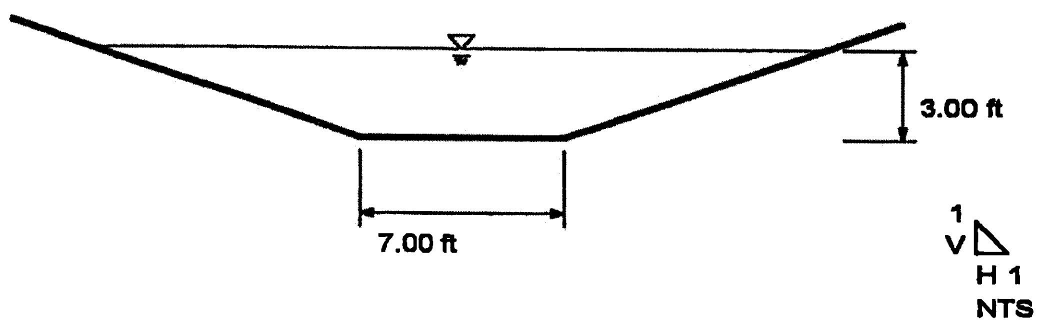
ASSUMED 3 FT OF FALL THROUGH PM4

Q from PM-C8=144 cfs

Cross Section
Cross Section for Trapezoidal Channel

Project Description	
Project File	y:\current projects\3077-barker homes\chnl-rev.fm2
Worksheet	CH-5
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficient	0.035	
Channel Slope	0.002500	ft/ft
Depth	3.00	ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Bottom Width	7.00	ft
Discharge	153.44	cfs



Cross Section for CH-5

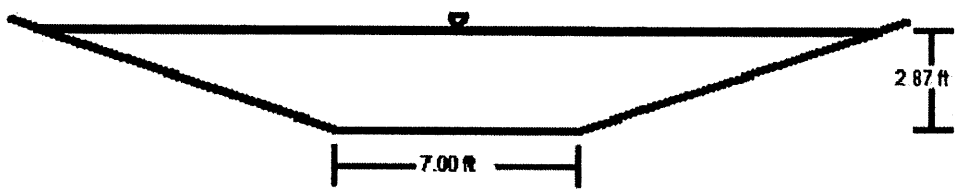
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.25000	%
Normal Depth	2.87	ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	7.00	ft
Discharge	140.00	ft³/s

Cross Section Image



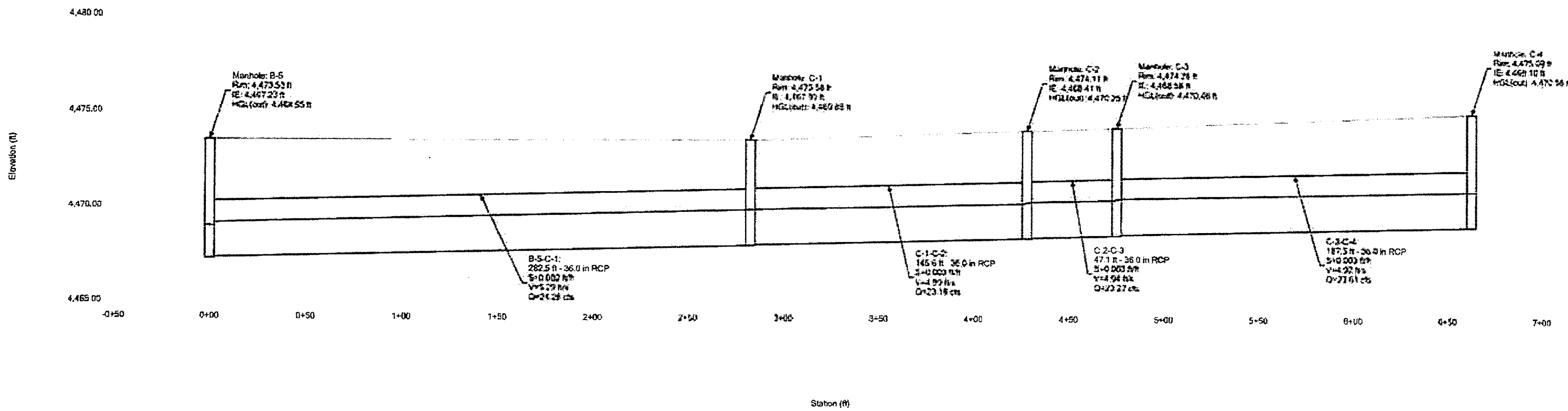
Appendix B - 5-Year Storm

Modified Form 2 (5 yr)
Hydraulic Grade Lines
Catch Basin Report
Manhole Report
Pipe/Node Report
0.40% Street 5-yr Storm Capacity

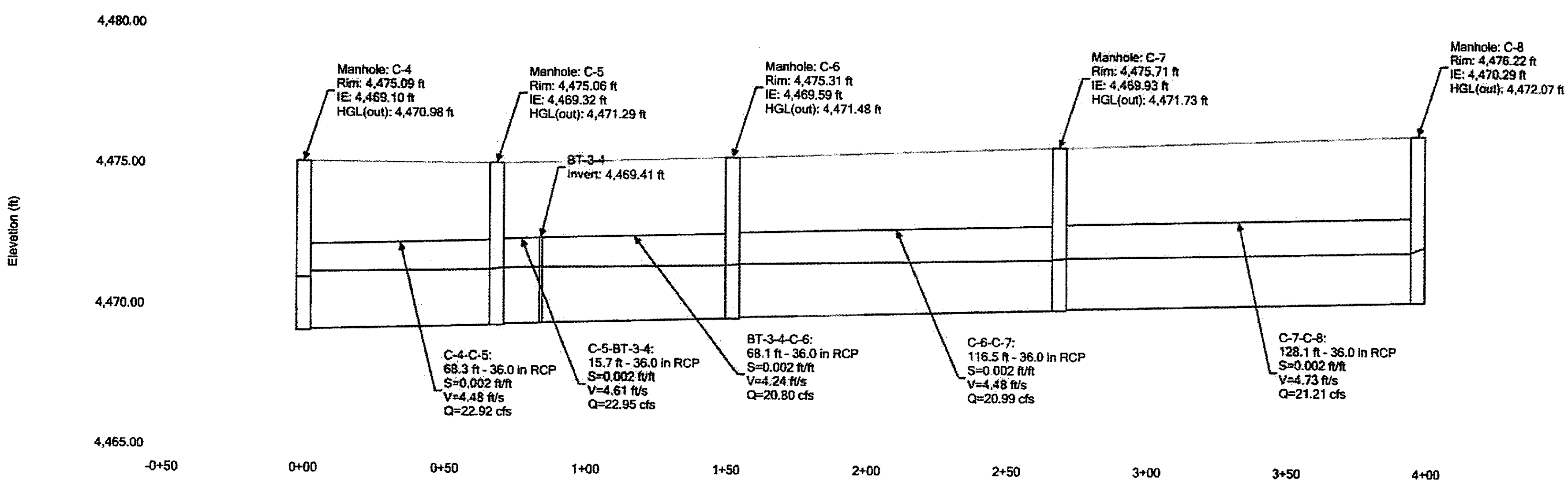
WOOD RODGERS

Drainage Basin	Drainage Area (AC)	Weighted Average C-Factor $_{5\text{-Year}}$	TIME OF CONCENTRATION: Initial Flow Time, T_i — Overland Flow			Travel Time, T_t — Gutter Flow				Total (T_i+T_t)	Urbanized Basins Check	Final	5-YEAR STORM EVENT: NOAA ATLAS 14 Rainfall Intensity	Rational Flow
			L_i (ft)	S (ft/ft)	T_i (min)	L_t (ft)	S (ft/ft)	V (ft/s)	T_{t2} (min)	T_c (min)	T_c*(min)	T_c (min)	$I_{5\text{-year}}$ (in/hour)	$Q_{5\text{-year}}$ (cfs)
B-1	1.02	0.60	106	0.0100	9.3	275	0.0040	1.3	3.6	12.8	12.1	**12.1**	**1.22**	**0.7**
B-2	0.31	0.60	25	0.0200	3.6	147	0.0040	1.3	1.9	5.5	11.0	**5.5**	**1.74**	**0.3**
B-3	1.78	0.60	132	0.0100	10.3	576	0.0040	1.3	7.5	17.8	13.9	**13.9**	**1.13**	**1.2**
B-4	2.14	0.60	103	0.0100	9.1	361	0.0040	1.3	4.7	13.8	12.6	**12.6**	**1.20**	**1.5**
B-5	0.56	0.60	122	0.0100	9.9	141	0.0050	1.4	1.6	11.6	11.5	**11.5**	**1.25**	**0.4**
B-6	0.87	0.60	127	0.0100	10.1	148	0.0050	1.4	1.7	11.9	11.5	**11.5**	**1.25**	**0.7**
B-7	0.96	0.60	22	0.0100	4.2	446	0.0040	1.3	5.8	10.0	12.6	**10.0**	**1.32**	**0.8**
B-8	0.45	0.60	66	0.0100	7.3	65	0.0040	1.3	0.8	8.2	10.7	**8.2**	**1.49**	**0.4**
B-9	1.02	0.60	61	0.0100	7.0	226	0.0040	1.3	2.9	10.0	11.6	**10.0**	**1.32**	**0.8**
B-10	1.48	0.60	98	0.0100	8.9	343	0.0040	1.3	4.4	13.4	12.5	**12.5**	**1.20**	**1.1**
B-11	2.24	0.60	40	0.0100	5.7	433	0.0040	1.3	5.6	11.3	12.6	**11.3**	**1.26**	**1.7**
B-12	0.73	0.60	96	0.0100	8.8	287	0.0040	1.3	3.7	12.5	12.1	**12.1**	**1.22**	**0.5**
B-13	1.35	0.60	102	0.0100	9.1	371	0.0040	1.3	4.8	13.9	12.6	**12.6**	**1.19**	**1.0**
B-14	1.30	0.60	71	0.0100	7.6	311	0.0040	1.3	4.0	11.6	12.1	**11.6**	**1.24**	**1.0**
B-15	1.33	0.60	121	0.0100	9.9	337	0.0040	1.3	4.4	14.3	12.5	**12.5**	**1.20**	**1.0**
B-16	2.95	0.60	64	0.0100	7.2	851	0.0040	1.3	11.0	18.2	15.1	**15.1**	**1.08**	**1.9**
B-17	1.58	0.60	84	0.0100	8.2	274	0.0040	1.3	3.6	11.8	12.0	**11.8**	**1.23**	**1.2**
B-18	2.49	0.60	132	0.0100	10.3	327	0.0040	1.3	4.2	14.6	12.6	**12.6**	**1.20**	**1.8**
B-19	1.21	0.60	132	0.0100	10.3	309	0.0040	1.3	4.0	14.3	12.5	**12.5**	**1.20**	**0.9**
B-20	0.81	0.60	115	0.0100	9.7	169	0.0040	1.3	2.2	11.8	11.6	**11.6**	**1.24**	**0.6**
B-21	1.61	0.60	102	0.0100	9.1	502	0.0040	1.3	6.5	15.6	13.4	**13.4**	**1.16**	**1.1**
B-22	1.11	0.60	118	0.0100	9.8	214	0.0040	1.3	2.8	12.6	11.8	**11.8**	**1.23**	**0.8**
B-23	0.99	0.60	142	0.0100	10.7	273	0.0040	1.3	3.5	14.3	12.3	**12.3**	**1.21**	**0.7**
B-24	0.38	0.60	59	0.0100	6.9	191	0.0040	1.3	2.5	9.4	11.4	**9.4**	**1.38**	**0.3**
B-25	1.44	0.60	68	0.0200	5.9	480	0.0040	1.3	6.2	12.1	13.0	**12.1**	**1.22**	**1.1**
B-26	1.30	0.60	110	0.0100	9.4	262	0.0040	1.3	3.4	12.8	12.1	**12.1**	**1.22**	**1.0**
B-27	0.19	0.88	34	0.0200	1.8	137	0.0040	1.3	1.8	5.0	11.0	**5.0**	**1.78**	**0.3**
B-28	0.21	0.88	33	0.0200	1.8	129	0.0040	1.3	1.7	5.0	10.9	**5.0**	**1.78**	**0.3**
B-29	2.64	0.60	134	0.0100	10.4	684	0.0040	1.3	8.9	19.3	14.5	**14.5**	**1.10**	**1.7**
B-30	0.23	0.60	105	0.0100	9.2	63	0.0279	3.4	0.3	9.5	10.9	**9.5**	**1.36**	**0.2**
B-31	0.09	0.88	29	0.0200	1.7	81	0.0040	1.3	1.1	5.0	10.6	**5.0**	**1.78**	**0.1**
B-32	0.27	0.88	38	0.0200	1.9	199	0.0040	1.3	2.6	5.0	11.3	**5.0**	**1.78**	**0.4**
B-33	2.54	0.05	193	0.0100	26.3					26.3	11.1	**11.1**	**1.27**	**0.2**
S-1	27.50	0.60	168	0.0100	11.7	1448	0.0040	1.3	18.8	30.4	19.0	**19.0**	**0.99**	**16.3**
W-6	3.50	0.60	127	0.0100	10.1	787	0.0040	1.3	10.2	20.3	15.1	**15.1**	**1.08**	**2.3**
W-7	0.84	0.60	102	0.0100	9.1	194	0.0040	1.3	2.5	11.6	11.6	**11.6**	**1.24**	**0.6**
W-8	2.34	0.60	103	0.0100	9.1	717	0.0040	1.3	9.3	18.4	14.6	**14.6**	**1.10**	**1.5**
FW-1	0.83	0.88	13	0.0200	1.1	1074	0.0040	1.3	13.9	15.1	16.0	**15.1**	**1.08**	**0.8**
FW-2	0.72	0.60	76	0.0100	7.8	85	0.0040	1.3	1.1	8.9	10.9	**8.9**	**1.42**	**0.6**
FW-3	0.88	0.60	76	0.0100	7.8	163	0.0040	1.3	2.1	10.0	11.3	**10.0**	**1.32**	**0.7**
FW-4	1.75	0.60	55	0.0100	6.7	486	0.0040	1.3	6.3	13.0	13.0	**13.0**	**1.18**	**1.2**
FW-5	0.43	0.60	39	0.0100	5.6	224	0.0040	1.3	2.9	8.5	11.5	**8.5**	**1.46**	**0.4**
FW-6	0.82	0.60	63	0.0100	7.1	301	0.0040	1.3	3.9	11.0	12.0	**11.0**	**1.27**	**0.6**
FW-7	0.16	0.60	60	0.0100	7.0	83	0.0040	1.3	1.1	8.0	10.8	**8.0**	**1.50**	**0.1**

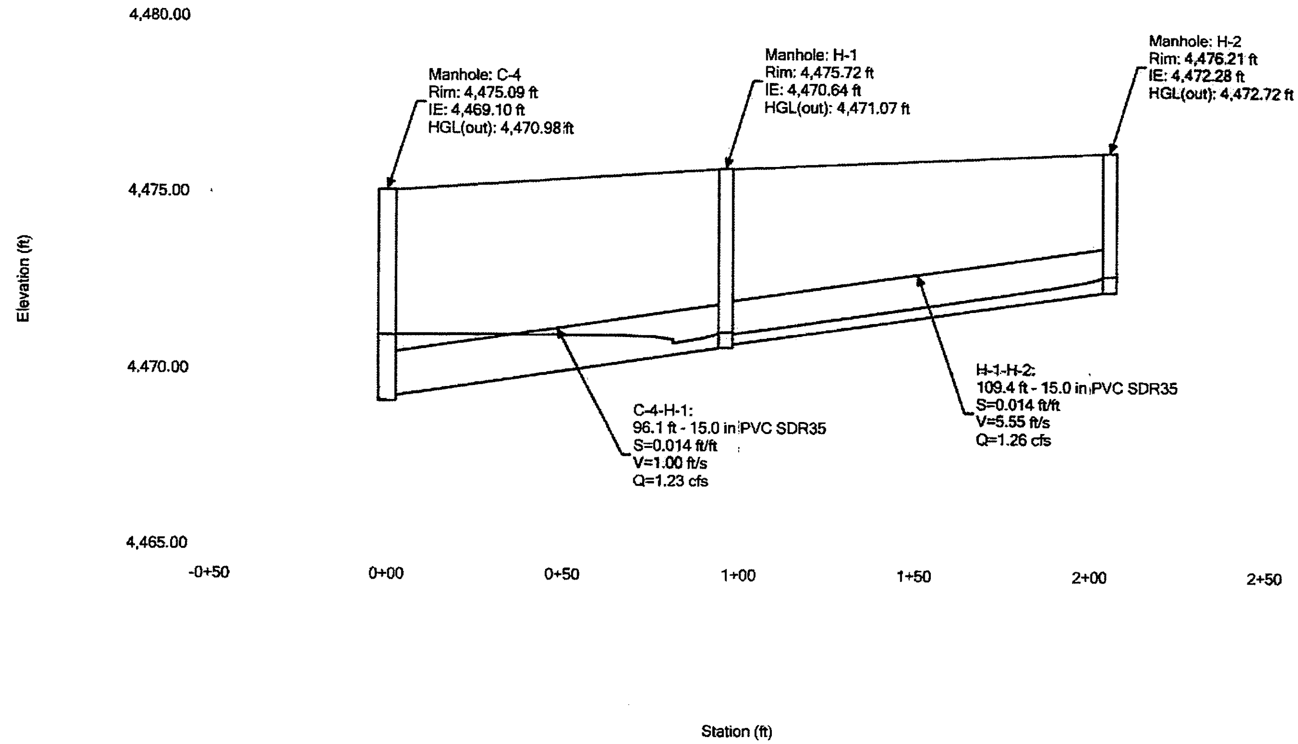
Profile Report
Engineering Profile - B5 TO C4 (PM_V6_OA_5YR.stsw)



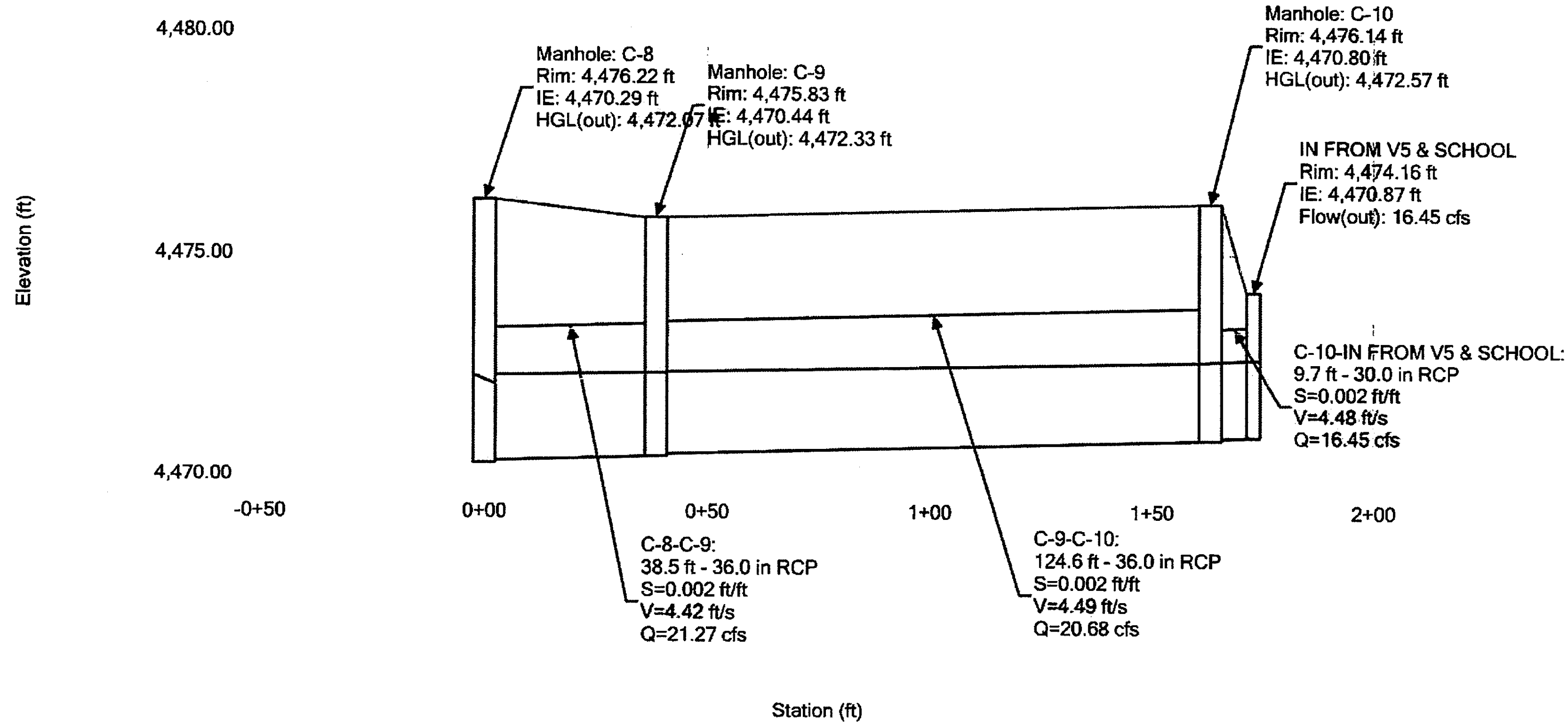
Profile Report
Engineering Profile - C4 TO C8 (PM_V6_OA_5YR.stsw)



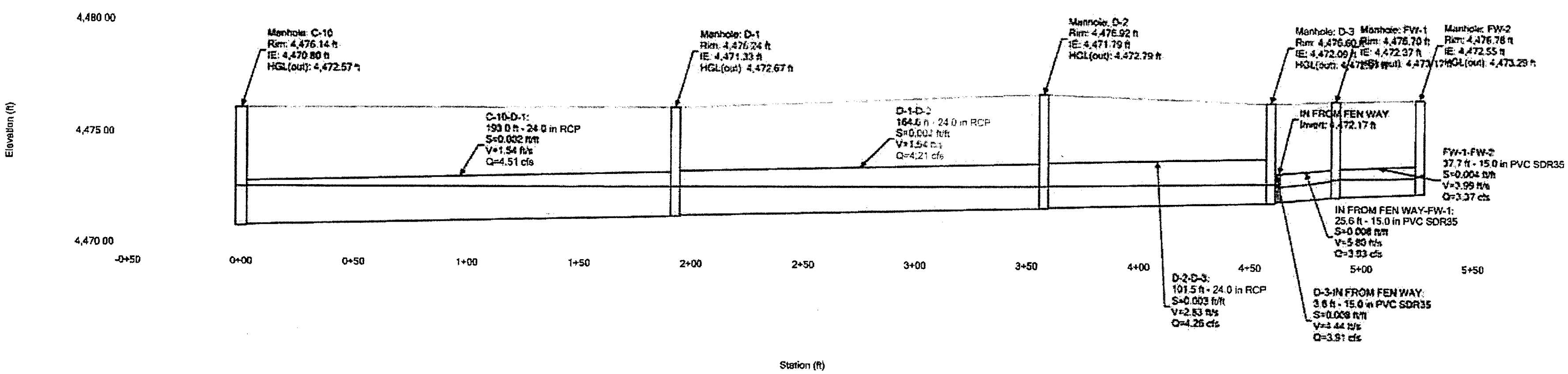
Profile Report
Engineering Profile - C4 TO H2 (PM_V6_OA_5YR.stsw)



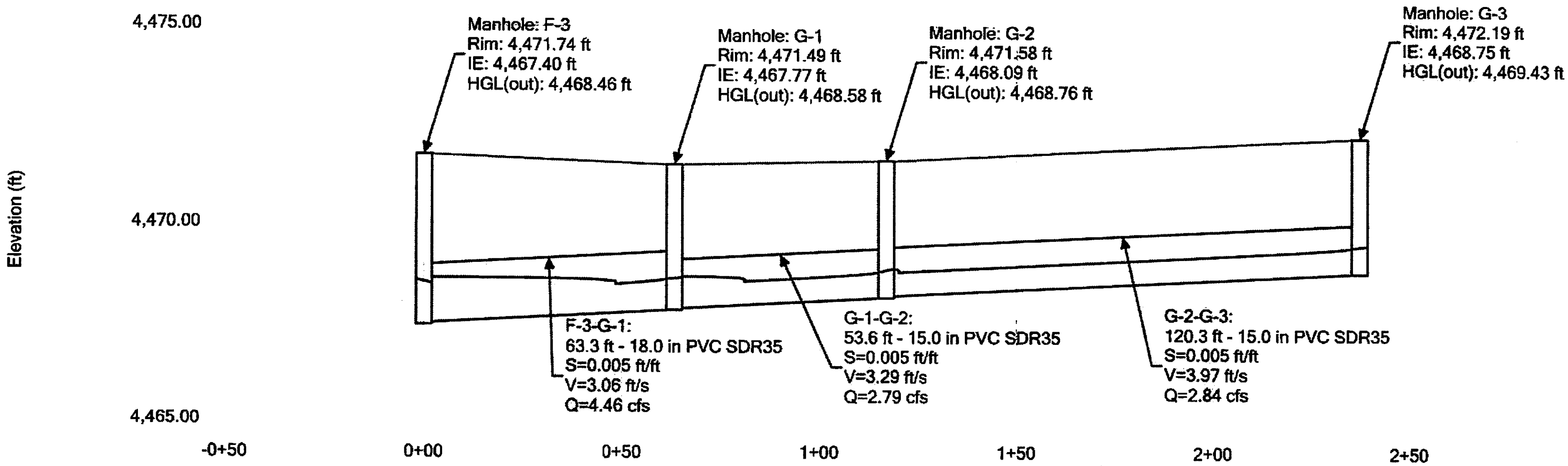
Profile Report
Engineering Profile - C8 TO SCHOOL (PM_V6_OA_5YR.stsw)



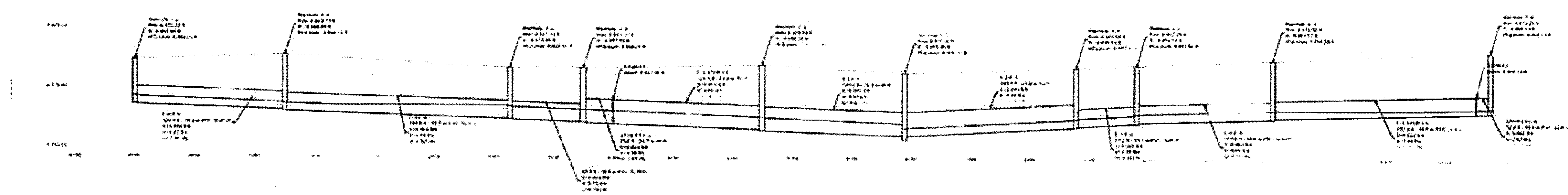
Profile Report
Engineering Profile - C10 TO FW2 (PM_V6_OA_5YR.stsw)



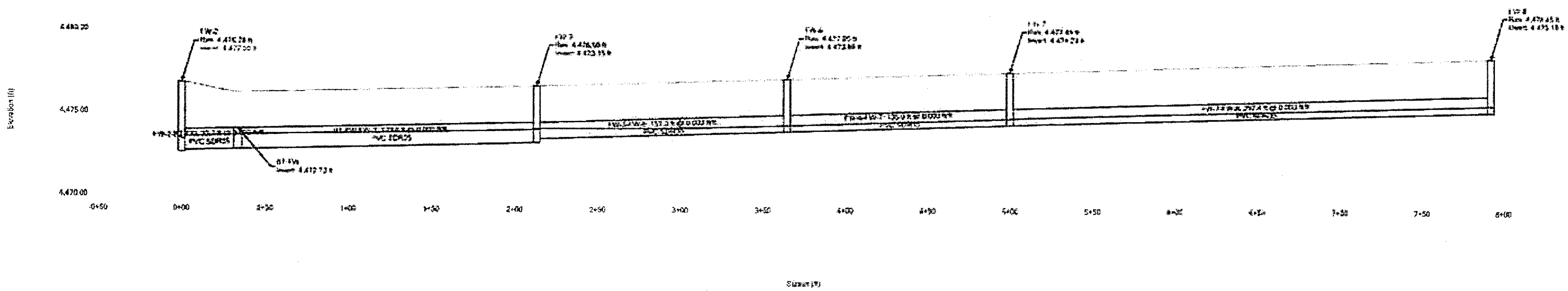
Profile Report
Engineering Profile - F3 TO G3 (PM_V6_OA_5YR.stsw)



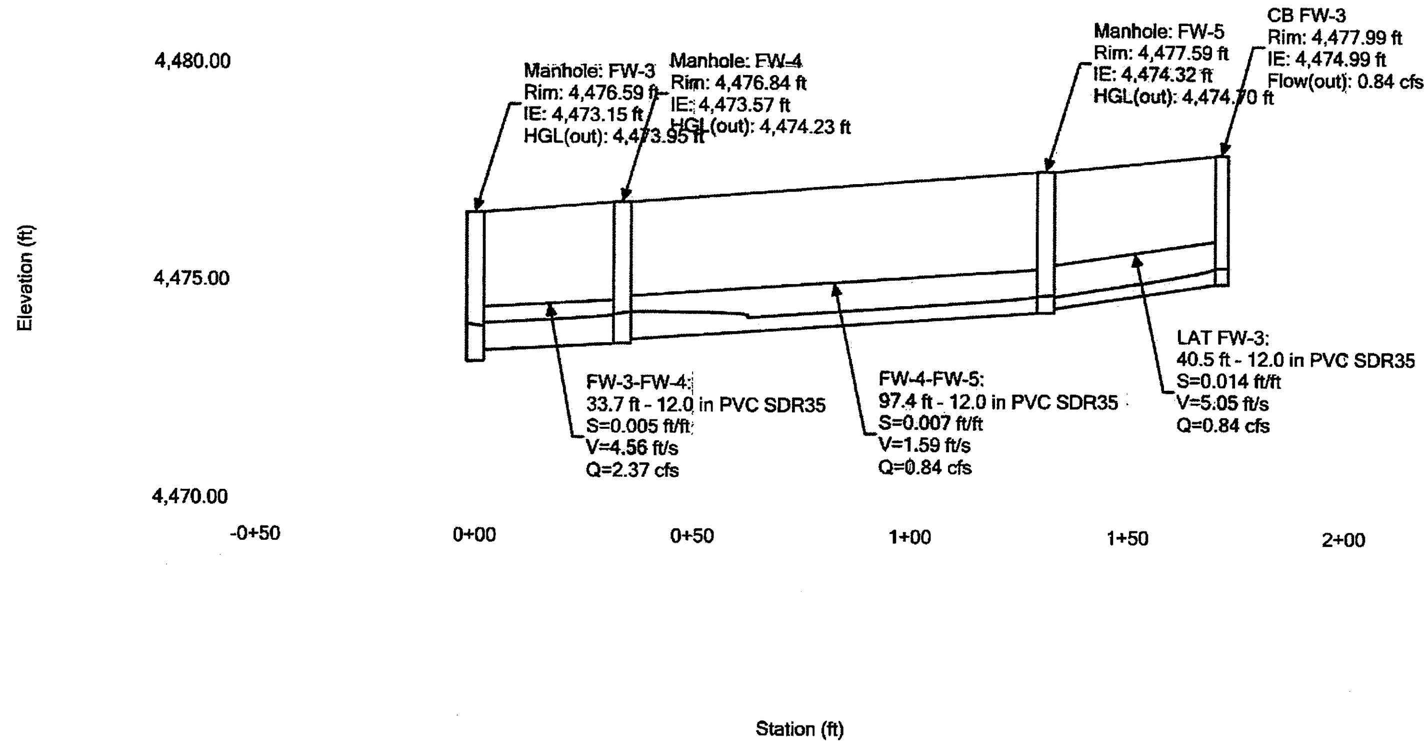
Profile Report
Engineering Profile - F5 TO E4 (PM_V6_OA_5YR.stsw)



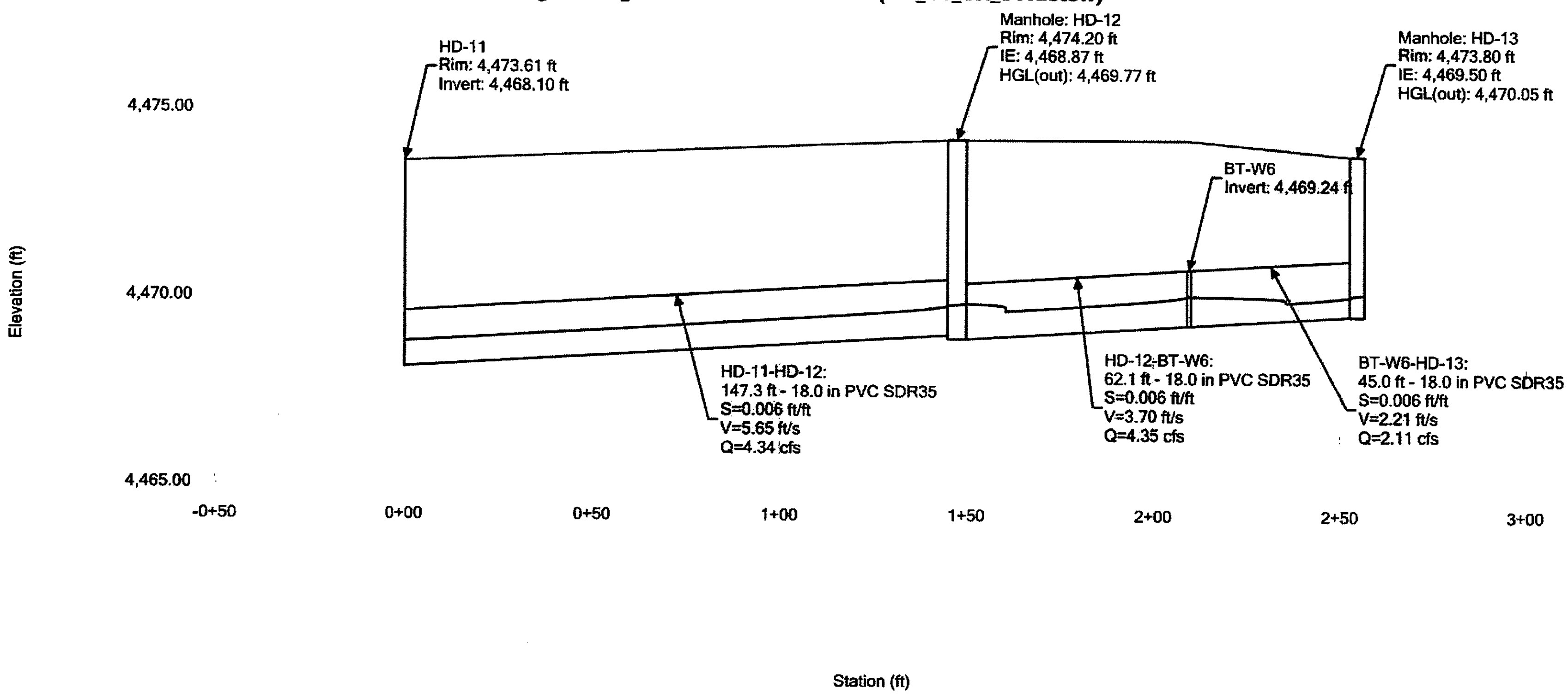
Profile Report
Engineering Profile - FW2 TO FW8 (PM_V6_OA_5YR.stsw)



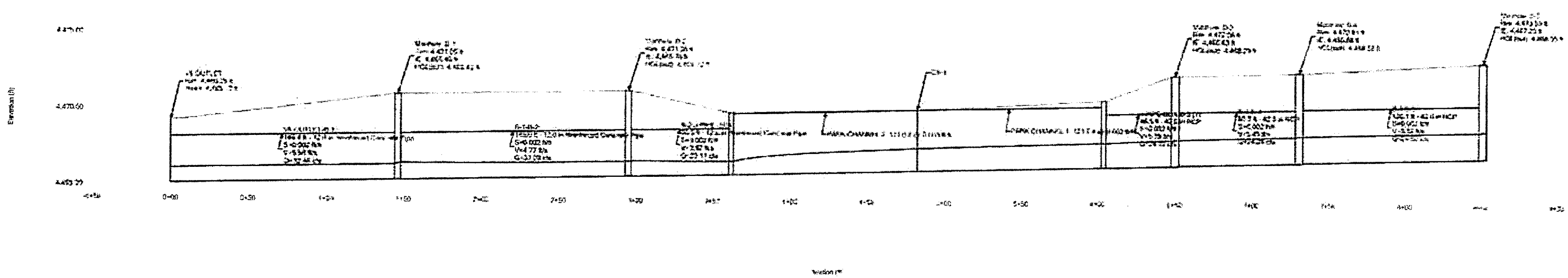
Profile Report
Engineering Profile - FW3 TO CB FW3 (PM_V6_OA_5YR.stsw)



Profile Report
Engineering Profile - HD11 TO HD13 (PM_V6_OA_5YR.stsw)



Profile Report
Engineering Profile - OUTLET TO B5 (PM_V6_OA_5YR.stsw)



FlexTable: Catch Basin Table 5-year

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Inlet Drainage Area (acres)	Total Inlet Tc (min)	Flow (Captured) (cfs)
CB FW-6	4,479.21	4,476.21	0.820	8.500	0.72
CB FW-7	4,479.21	4,476.21	0.160	5.500	0.17
CB FW-3	4,477.99	4,474.99	0.880	7.100	0.84
CB FW-1	4,477.23	4,475.06	0.830	14.800	0.80
CB-3	4,476.74	4,474.72	1.780	13.900	1.22
CB-32	4,476.72	4,473.72	0.270	5.000	0.43
CB-31	4,476.72	4,473.72	0.090	5.000	0.14
CB FW-4	4,476.72	4,473.72	1.750	10.600	1.37
CB FW-5	4,476.72	4,473.72	0.430	6.500	0.43
CB-28	4,476.47	4,473.47	0.210	5.000	0.33
CB-27	4,476.47	4,473.47	0.190	5.000	0.30
CB FW-2	4,476.18	4,474.01	0.720	6.100	0.73
CB-6	4,475.74	4,472.74	0.870	8.200	0.78
CB-5	4,475.74	4,472.74	0.560	8.000	0.51
CB-2	4,475.66	4,472.66	0.310	5.000	0.33
CB-1	4,475.60	4,472.66	1.020	9.500	0.84
CB-4	4,475.22	4,472.22	2.140	10.500	1.68
CB W-6	4,474.37	4,470.06	3.500	15.100	2.28
IN FROM V5 & SCHOOL	4,474.16	4,470.87	27.500	19.000	16.45
CB-9	4,473.76	4,470.75	1.020	7.400	0.96
CB-10	4,473.71	4,470.71	1.480	10.100	1.18
CB W-8	4,473.65	4,470.65	2.340	14.600	1.56
CB W-7	4,473.65	4,470.65	0.840	8.300	0.75
CB-13	4,473.51	4,470.51	1.350	10.600	0.67
CB-12	4,473.51	4,470.51	0.730	9.400	0.43
CB-7	4,473.19	4,470.15	0.960	8.500	0.85
CB-8	4,473.19	4,470.15	0.450	5.500	0.47
CB-17	4,472.44	4,469.44	1.580	8.800	1.37
CB-16	4,472.44	4,469.40	2.950	15.100	1.92
CB-11	4,472.23	4,469.23	2.240	9.300	1.88
CB-23	4,472.23	4,469.23	0.990	10.400	0.72
CB-14	4,472.08	4,469.08	1.300	8.900	1.30
CB-15	4,472.08	4,469.08	1.330	10.700	1.03
CB-22	4,471.95	4,468.95	1.110	9.000	0.95
CB-24	4,471.54	4,468.54	0.380	6.900	0.37
CB-18	4,471.47	4,469.14	2.490	10.900	1.92
CB-19	4,471.47	4,469.14	1.210	10.600	0.94
CB-21	4,471.44	4,468.44	1.610	12.300	1.18
CB-20	4,471.44	4,468.44	0.810	8.400	0.72
CB-29	4,471.02	4,468.02	2.640	14.500	1.76
CB-30	4,471.02	4,468.02	0.230	6.200	0.23
CB-26	4,470.23	4,467.23	1.300	9.400	1.08
CB-25	4,470.23	4,467.23	1.440	10.000	1.60

FlexTable: Manhole Table 5-year

Label	Elevation (Rim) (ft)	Elevation (Invert In 1) (ft)	Elevation (Invert Out) (ft)	Diameter (in)	Flow (Total Out) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
FW-8	4,478.45	4,475.28	4,475.18	48.0	0.85	4,475.59	4,475.58
FW-5	4,477.59	4,474.42	4,474.32	48.0	0.84	4,474.73	4,474.70
FW-7	4,477.49	4,474.32	4,474.29	48.0	0.77	4,474.69	4,474.67
FW-6	4,477.05	4,473.88	4,473.86	48.0	0.75	4,474.26	4,474.23
D-2	4,476.92	4,471.84	4,471.79	48.0	4.21	4,472.81	4,472.79
FW-4	4,476.84	4,473.67	4,473.57	48.0	2.37	4,474.31	4,474.23
FW-2	4,476.78	4,472.65	4,472.55	48.0	3.37	4,473.48	4,473.29
FW-1	4,476.70	4,472.61	4,472.37	48.0	3.93	4,473.21	4,473.17
D-3	4,476.60	4,472.14	4,472.09	48.0	4.26	4,472.97	4,472.97
FW-3	4,476.59	4,473.40	4,473.15	48.0	2.98	4,474.02	4,473.95
D-1	4,476.24	4,471.38	4,471.33	48.0	4.51	4,472.67	4,472.67
H-2	4,476.21	4,472.38	4,472.28	48.0	1.26	4,472.74	4,472.72
H-1	4,475.72	4,470.74	4,470.64	48.0	1.23	4,471.10	4,471.07
HD-13	4,473.80	4,469.61	4,469.50	48.0	2.11	4,470.10	4,470.05
E-4	4,473.24	4,468.23	4,468.13	48.0	1.07	4,468.55	4,468.53
F-4	4,472.77	4,468.16	4,468.06	48.0	2.92	4,468.73	4,468.71
E-3	4,472.50	4,467.67	4,467.57	48.0	3.15	4,468.31	4,468.28
F-5	4,472.32	4,468.65	4,468.60	48.0	2.95	4,469.32	4,469.25
G-3	4,472.19	4,468.77	4,468.75	48.0	2.84	4,469.47	4,469.43
E-2	4,472.04	4,467.28	4,467.17	48.0	3.77	4,467.95	4,467.92
E-1	4,471.80	4,466.92	4,466.82	48.0	3.74	4,467.52	4,467.50
F-3	4,471.74	4,467.45	4,467.40	48.0	6.74	4,468.55	4,468.46
G-2	4,471.58	4,468.14	4,468.09	48.0	2.79	4,468.84	4,468.76
G-1	4,471.49	4,467.82	4,467.77	48.0	4.46	4,468.60	4,468.58
B-2	4,471.35	4,466.10	4,465.76	48.0	31.29	4,466.74	4,466.72
A-1	4,471.15	4,466.53	4,466.43	48.0	1.91	4,467.05	4,467.02
B-1	4,471.05	4,465.46	4,465.46	48.0	32.46	4,466.55	4,466.45
C-8	4,476.22	4,470.34	4,470.29	60.0	21.21	4,472.27	4,472.07
C-10	4,476.14	4,470.85	4,470.80	60.0	20.68	4,472.60	4,472.57
C-9	4,475.83	4,470.49	4,470.44	60.0	21.27	4,472.33	4,472.33
C-7	4,475.71	4,469.98	4,469.93	60.0	20.99	4,471.80	4,471.73
C-6	4,475.31	4,469.64	4,469.59	60.0	20.80	4,471.53	4,471.48
C-4	4,475.09	4,469.25	4,469.10	60.0	23.61	4,470.99	4,470.98
C-5	4,475.06	4,469.37	4,469.32	60.0	22.92	4,471.36	4,471.29
C-3	4,474.28	4,468.63	4,468.58	60.0	23.27	4,470.56	4,470.46
HD-12	4,474.20	4,468.87	4,468.97	60.0	4.34	4,469.82	4,469.77
C-2	4,474.11	4,468.46	4,468.41	60.0	23.18	4,470.36	4,470.25
C-1	4,473.58	4,468.04	4,467.99	60.0	24.26	4,469.89	4,469.88
B-5	4,473.53	4,467.28	4,467.23	60.0	24.52	4,468.99	4,468.95
B-4	4,472.81	4,466.93	4,466.88	60.0	24.28	4,468.62	4,468.58
B-3	4,472.56	4,466.68	4,466.63	60.0	24.12	4,468.33	4,468.29
F-1	4,471.99	4,466.61	4,466.52	60.0	7.32	4,467.62	4,467.57
F-2	4,471.72	4,467.19	4,467.14	60.0	7.41	4,468.22	4,468.20

Conduit FlexTable: Combined Pipe/Node Report 5-year

Label	Start Node	Stop Node	Length (Unified) (ft)	Slope (Calculated) (ft/ft)	Capacity (Full Flow) (cfs)	Invert (Start) (ft)	Invert (Stop) (ft)	Flow (cfs)	Velocity (ft/s)
HD-12-BT-W6	BT-W6	HD-12	62.1	0.006	10.49	4,469.24	4,468.87	4.35	5.66
BT-W6-HD-13	HD-13	BT-W6	45.0	0.006	10.49	4,469.50	4,469.24	2.11	4.64
LAT W-6	CB W-6	BT-W6	5.8	0.364	50.68	4,471.37	4,469.24	2.28	20.86
LAT FW-6	CB FW-6	FW-8	67.0	0.014	5.46	4,476.21	4,475.28	0.72	4.82
LAT FW-7	CB FW-7	FW-8	36.1	0.026	7.43	4,476.21	4,475.28	0.17	3.88
FW-7-FW-8	FW-8	FW-7	292.4	0.003	2.51	4,475.18	4,474.32	0.85	2.89
LAT FW-3	CB FW-3	FW-5	40.5	0.014	5.49	4,474.99	4,474.42	0.84	5.07
FW-4-FW-5	FW-5	FW-4	97.4	0.007	3.78	4,474.32	4,473.67	0.84	3.87
FW-6-FW-7	FW-7	FW-6	135.0	0.003	2.55	4,474.29	4,473.88	0.77	2.85
LAT FW-1	CB FW-1	FW-1	37.7	0.065	11.81	4,475.06	4,472.61	0.80	8.59
FW-3-FW-6	FW-6	FW-3	151.3	0.003	2.55	4,473.86	4,473.40	0.75	2.83
D-2-D-3	D-3	D-2	101.5	0.003	11.31	4,472.09	4,471.84	4.26	3.35
D-1-D-2	D-2	D-1	164.6	0.002	11.31	4,471.79	4,471.38	4.21	3.34
FW-3-FW-4	FW-4	FW-3	33.7	0.005	3.29	4,473.57	4,473.40	2.37	4.56
LAT FW-5	CB FW-5	FW-4	12.7	0.004	2.91	4,473.72	4,473.67	0.43	2.65
LAT FW-4	CB FW-4	FW-4	35.0	0.001	1.75	4,473.72	4,473.67	1.37	2.46
FW-1-FW-2	FW-2	FW-1	37.7	0.004	5.12	4,472.55	4,472.41	3.37	4.45
FW-2-BT-FW	BT-FW	FW-2	33.7	0.002	4.09	4,472.73	4,472.65	3.40	3.73
LAT 03	CB-3	BT-3-4	32.1	0.134	16.98	4,474.72	4,470.41	1.22	12.54
LAT 32	CB-32	D-3	23.4	0.067	12.03	4,473.72	4,472.14	0.43	7.21
LAT 31	CB-31	D-3	10.7	0.147	17.76	4,473.72	4,472.14	0.14	6.82
IN FROM FEN WAY-FW-1	FW-1	IN FROM FEN WAY	25.6	0.008	7.43	4,472.37	4,472.17	3.93	6.14
D-3-IN FROM FEN WAY	IN FROM FEN WAY	D-3	3.6	0.008	7.42	4,472.17	4,472.14	3.91	6.12
BT-FW-FW-3	FW-3	BT-FW	179.6	0.002	4.06	4,473.15	4,472.73	2.98	3.61
LAT 28	CB-28	D-1	29.1	0.070	12.27	4,473.47	4,471.43	0.33	6.77
LAT 27	CB-27	D-1	5.4	0.378	28.49	4,473.47	4,471.43	0.30	11.88
C-10-D-1	D-1	C-10	193.0	0.002	11.31	4,471.33	4,470.85	4.51	3.40
C-8-C-9	C-9	C-8	38.5	0.002	33.35	4,470.44	4,470.34	21.27	5.00
C-7-C-8	C-8	C-7	128.1	0.002	32.80	4,470.29	4,469.98	21.21	4.93
H-1-H-2	H-2	H-1	109.4	0.014	9.96	4,472.28	4,470.74	1.26	5.55
LAT 05	CB-5	H-2	59.2	0.006	3.61	4,472.74	4,472.38	0.51	3.25
LAT 06	CB-6	H-2	72.7	0.005	3.27	4,472.74	4,472.38	0.78	3.42
LAT FW-2	CB FW-2	BT-FW	16.9	0.076	12.75	4,474.01	4,472.73	0.73	8.81
C-10-IN FROM V5 & SCHOOL	IN FROM V5 & SCHOOL	C-10	9.7	0.002	18.59	4,470.87	4,470.85	16.45	4.28
C-9-C-10	C-10	C-9	124.6	0.002	33.26	4,470.80	4,470.49	20.68	4.96
LAT 02	CB-2	C-9	11.7	0.173	19.26	4,472.66	4,470.64	0.33	9.30
LAT 01	CB-1	C-9	47.5	0.042	9.55	4,472.66	4,470.64	0.84	7.49
C-4-H-1	H-1	C-4	96.1	0.014	10.10	4,470.64	4,469.25	1.23	5.58
C-6-C-7	C-7	C-6	116.5	0.002	33.35	4,469.93	4,469.64	20.99	4.99
BT-3-4-C-6	C-6	BT-3-4	68.1	0.002	33.35	4,469.59	4,469.42	20.80	4.98
LAT 04	CB-4	BT-3-4	7.5	0.242	22.80	4,472.22	4,470.41	1.68	16.96
C-4-C-5	C-5	C-4	68.3	0.002	33.28	4,469.32	4,469.15	22.92	5.08
C-3-C-4	C-4	C-3	187.3	0.003	33.41	4,469.10	4,468.63	23.61	5.13
C-5-BT-3-4	BT-3-4	C-5	15.7	0.002	33.35	4,469.41	4,469.37	22.95	5.09
C-2-C-3	C-3	C-2	47.1	0.003	33.67	4,468.58	4,468.46	23.27	5.14
HD-11-HD-12	HD-12	HD-11	147.3	0.006	10.49	4,468.97	4,468.10	4.34	5.65
C-1-C-2	C-2	C-1	145.6	0.003	33.63	4,468.41	4,468.04	23.18	5.13

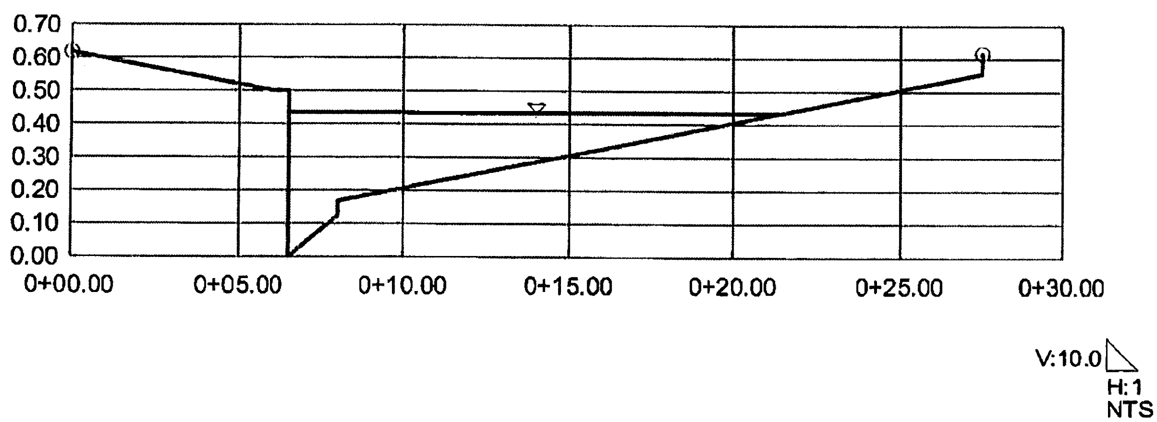
Conduit FlexTable: Combined Pipe/Node Report 5-year

Label	Start Node	Stop Node	Length (Unified) (ft)	Slope (Calculated) (ft/ft)	Capacity (Full Flow) (cfs)	Invert (Start) (ft)	Invert (Stop) (ft)	Flow (cfs)	Velocity (ft/s)
LAT W-7	CB W-7	HD-13	30.6	0.034	8.54	4,470.65	4,469.61	0.75	6.69
LAT W-8	CB W-8	HD-13	41.4	0.025	7.34	4,470.65	4,469.61	1.56	7.42
LAT 09	CB-9	C-1	33.5	0.081	13.17	4,470.75	4,468.04	0.96	9.78
LAT 10	CB-10	B-5	32.7	0.105	15.00	4,470.71	4,467.28	1.18	11.39
LAT 07	CB-7	C-1	57.7	0.037	8.86	4,470.15	4,468.04	0.85	7.12
LAT 08	CB-8	C-1	40.6	0.052	10.56	4,470.15	4,468.04	0.47	6.77
B-5-C-1	C-1	B-5	282.5	0.002	33.35	4,467.99	4,467.28	24.26	5.15
B-4-B-5	B-5	B-4	120.1	0.002	50.30	4,467.23	4,466.93	24.52	5.20
LAT 13	CB-13	E-4	23.5	0.097	14.41	4,470.51	4,468.23	0.67	9.36
LAT 12	CB-12	E-4	39.5	0.058	11.12	4,470.51	4,468.23	0.43	6.85
STUB E3-E-4	E-4	STUB E3	12.2	0.002	6.83	4,468.13	4,468.10	1.07	2.82
B-3-B-4	B-4	B-3	80.7	0.002	50.30	4,466.88	4,466.68	24.28	5.18
F-3-F-4	F-4	F-3	188.0	0.003	7.78	4,468.06	4,467.45	2.92	4.09
F-4-F-5	F-5	F-4	125.0	0.004	8.10	4,468.60	4,468.16	2.95	4.22
J-PIPE-BOX-B-3 (1)	B-3	PARK INLET	46.5	0.002	50.30	4,466.63	4,466.51	24.12	5.17
LAT 15	CB-15	E-3	63.9	0.022	6.88	4,469.08	4,467.67	1.03	6.31
LAT 14	CB-14	E-3	75.4	0.019	6.33	4,469.08	4,467.67	1.30	6.34
E-3-STUB E3	STUB E3	E-3	172.0	0.002	6.83	4,468.10	4,467.67	1.07	2.82
E-2-E-3	E-3	E-2	114.6	0.002	6.83	4,467.57	4,467.28	3.15	3.79
LAT 17	CB-17	F-5	26.0	0.030	8.07	4,469.44	4,468.65	1.37	7.66
LAT 16	CB-16	F-5	40.8	0.018	6.28	4,469.40	4,468.65	1.92	7.03
LAT 11	CB-11	PARK INLET	35.7	0.076	12.79	4,469.23	4,466.51	1.88	11.63
LAT 23	CB-23	E-2	9.1	0.214	21.41	4,469.23	4,467.28	0.72	12.66
G-2-G-3	G-3	G-2	120.3	0.005	5.98	4,468.75	4,468.14	2.84	4.81
LAT 19	CB-19	G-3	40.5	0.009	4.43	4,469.14	4,468.77	0.94	4.48
LAT 18	CB-18	G-3	57.6	0.006	3.71	4,469.14	4,468.77	1.92	4.77
E-1-E-2	E-2	E-1	51.2	0.005	9.66	4,467.17	4,466.92	3.77	5.12
B-2-F-1	F-1	B-2	120.2	0.003	13.38	4,466.52	4,466.10	7.32	4.36
F-1-STUB F1	STUB F1	F-1	124.9	0.003	13.38	4,467.05	4,466.61	7.40	4.37
LAT 22	CB-22	F-2	6.2	0.285	24.74	4,468.95	4,467.19	0.95	15.17
B-2-E-1	E-1	B-2	144.1	0.005	16.00	4,466.82	4,466.10	3.74	4.16
F-2-F-3	F-3	F-2	61.4	0.003	7.99	4,467.40	4,467.19	6.74	5.07
F-3-G-1	G-1	F-3	63.3	0.005	9.71	4,467.77	4,467.45	4.46	5.38
STUB F1-F-2	F-2	STUB F1	25.0	0.003	13.38	4,467.14	4,467.05	7.41	4.37
G-1-G-2	G-2	G-1	53.6	0.005	5.96	4,468.09	4,467.82	2.79	4.78
LAT 24	CB-24	B-2	47.5	0.051	10.50	4,468.54	4,466.10	0.37	6.28
LAT 21	CB-21	G-1	32.5	0.020	6.50	4,468.44	4,467.80	1.18	6.28
LAT 20	CB-20	G-1	8.5	0.075	12.69	4,468.44	4,467.80	0.72	8.74
B-2-J-PIPE-BOX	PARK OUTLET	B-2	66.5	0.002	119.61	4,465.89	4,465.76	23.11	4.87
B-1-B-2	B-2	B-1	149.0	0.002	120.03	4,465.76	4,465.46	31.29	5.41
LAT 30	CB-30	A-1	43.0	0.035	8.62	4,468.02	4,466.53	0.23	4.75
LAT 29	CB-29	A-1	22.8	0.065	11.85	4,468.02	4,466.53	1.76	10.82
OUT TO R.M. DRIVE-A -1	A-1	OUT TO R.M. DRIVE	30.4	0.005	3.25	4,466.43	4,466.28	1.91	4.31
V6 OUTLET-B-1	B-1	V6 OUTLET	146.4	0.002	119.06	4,465.46	4,465.17	32.46	5.44
LAT 25	CB-25	B-1	68.2	0.019	6.32	4,467.23	4,465.96	1.60	6.71
LAT 26	CB-26	B-1	21.1	0.060	11.37	4,467.23	4,465.96	1.08	9.12

0.40% Street 5-yr Storm Capacity
Cross Section for Irregular Channel

Project Description	
Worksheet	0.40% HALF STRE
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Mannings Coefficiei	0.013	
Channel Slope	0.004000	ft/ft
Water Surface Elev	0.44	ft
Elevation Range	.00 to 0.62	
Discharge	4.95	cfs



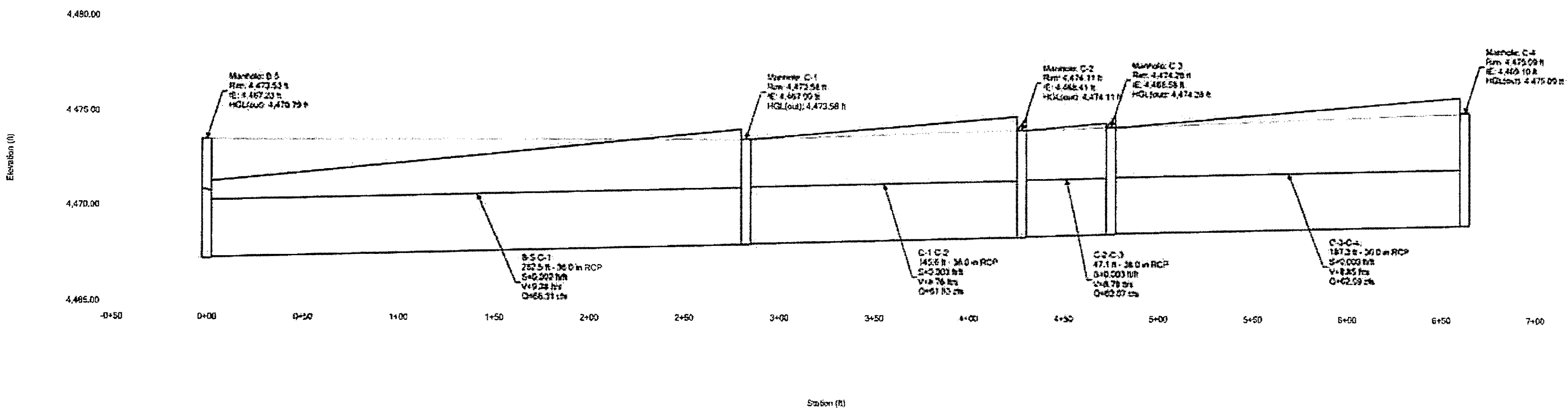
Appendix C - 100-Year Storm

Modified Form 2 (100 yr)
Hydraulic Grade Lines
Catch Basin Report
Manhole Report
Pipe/Node Report
0.40% Street 100-yr Storm Capacity

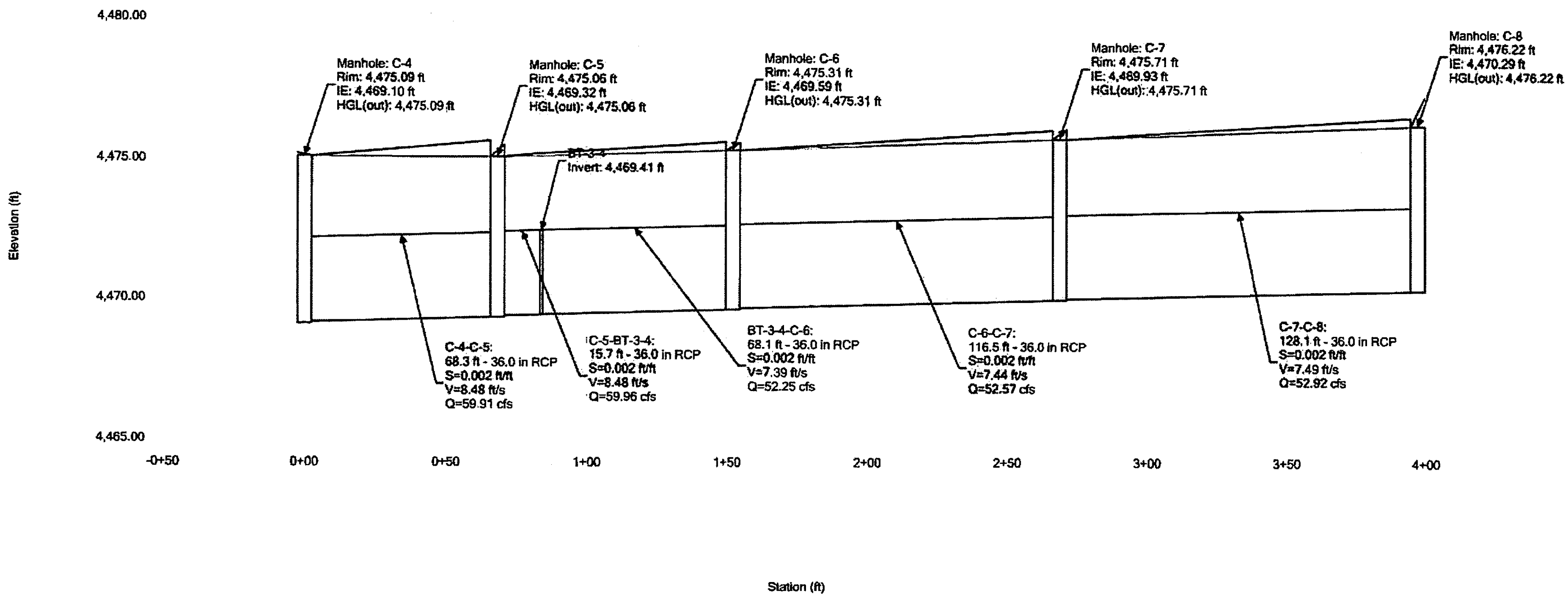
WOOD RODGERS

Drainage Basin	Drainage Area (AC)	Weighted Average C-Factor 100-Year	TIME OF CONCENTRATION: Initial Flow Time, T_i — Overland Flow			Travel Time, T_t — Gutter Flow				Total (T_i+T_t)	Urbanized Basins Check	Final	100-YEAR STORM EVENT: NOAA ATLAS 14 Rainfall Intensity	Rational Flow
			L_i (ft)	S (ft/ft)	T_i (min)	L_t (ft)	S (ft/ft)	V (ft/s)	T_{t2} (min)	T_c (min)	T_c*(min)	T_c (min)	$I_{100\text{-}year}$ (in/hour)	$Q_{100\text{-}year}$ (cfs)
B-1	1.02	0.78	106	0.0100	5.9	275	0.0040	1.3	3.6	9.5	12.1	**9.5**	**3.63**	**2.9**
B-2	0.31	0.78	25	0.0200	2.3	147	0.0040	1.3	1.9	5.0	11.0	**5.0**	**4.73**	**1.1**
B-3	1.78	0.78	132	0.0100	6.6	576	0.0040	1.3	7.5	14.1	13.9	**13.9**	**3.01**	**4.2**
B-4	2.14	0.78	103	0.0100	5.8	361	0.0040	1.3	4.7	10.5	12.6	**10.5**	**3.44**	**5.7**
B-5	0.56	0.78	122	0.0100	6.4	141	0.0050	1.4	1.6	8.0	11.5	**8.0**	**4.00**	**1.7**
B-6	0.87	0.78	127	0.0100	6.5	148	0.0050	1.4	1.7	8.2	11.5	**8.2**	**3.95**	**2.7**
B-7	0.96	0.78	22	0.0100	2.7	446	0.0040	1.3	5.8	8.5	12.6	**8.5**	**3.88**	**2.9**
B-8	0.45	0.78	66	0.0100	4.7	65	0.0040	1.3	0.8	5.5	10.7	**5.5**	**4.60**	**1.6**
B-9	1.02	0.78	61	0.0100	4.5	226	0.0040	1.3	2.9	7.4	11.6	**7.4**	**4.14**	**3.3**
B-10	1.48	0.78	98	0.0100	5.7	343	0.0040	1.3	4.4	10.1	12.5	**10.1**	**3.49**	**4.0**
B-11	2.24	0.78	40	0.0100	3.6	433	0.0040	1.3	5.6	9.3	12.6	**9.3**	**3.69**	**6.4**
B-12	0.73	0.78	96	0.0100	5.6	287	0.0040	1.3	3.7	9.4	12.1	**9.4**	**3.67**	**2.1**
B-13	1.35	0.78	102	0.0100	5.8	371	0.0040	1.3	4.8	10.6	12.6	**10.6**	**3.43**	**3.6**
B-14	1.30	0.78	71	0.0100	4.9	311	0.0040	1.3	4.0	8.9	12.1	**8.9**	**3.78**	**3.8**
B-15	1.33	0.78	121	0.0100	6.3	337	0.0040	1.3	4.4	10.7	12.5	**10.7**	**3.42**	**3.5**
B-16	2.95	0.78	64	0.0100	4.6	851	0.0040	1.3	11.0	15.6	15.1	**15.1**	**2.86**	**6.6**
B-17	1.58	0.78	84	0.0100	5.3	274	0.0040	1.3	3.6	8.8	12.0	**8.8**	**3.80**	**4.7**
B-18	2.49	0.78	132	0.0100	6.6	327	0.0040	1.3	4.2	10.9	12.6	**10.9**	**3.40**	**6.6**
B-19	1.21	0.78	132	0.0100	6.6	309	0.0040	1.3	4.0	10.6	12.5	**10.6**	**3.43**	**3.2**
B-20	0.81	0.78	115	0.0100	6.2	169	0.0040	1.3	2.2	8.4	11.6	**8.4**	**3.91**	**2.5**
B-21	1.61	0.78	102	0.0100	5.8	502	0.0040	1.3	6.5	12.3	13.4	**12.3**	**3.21**	**4.0**
B-22	1.11	0.78	118	0.0100	6.3	214	0.0040	1.3	2.8	9.0	11.8	**9.0**	**3.75**	**3.2**
B-23	0.99	0.78	142	0.0100	6.9	273	0.0040	1.3	3.5	10.4	12.3	**10.4**	**3.46**	**2.7**
B-24	0.38	0.78	59	0.0100	4.4	191	0.0040	1.3	2.5	6.9	11.4	**6.9**	**4.27**	**1.3**
B-25	1.44	0.78	68	0.0200	3.8	480	0.0040	1.3	6.2	10.0	13.0	**10.0**	**3.51**	**3.9**
B-26	1.30	0.78	110	0.0100	6.0	262	0.0040	1.3	3.4	9.4	12.1	**9.4**	**3.65**	**3.7**
B-27	0.19	0.93	34	0.0200	1.4	137	0.0040	1.3	1.8	5.0	11.0	**5.0**	**4.73**	**0.8**
B-28	0.21	0.93	33	0.0200	1.4	129	0.0040	1.3	1.7	5.0	10.9	**5.0**	**4.73**	**0.9**
B-29	2.64	0.78	134	0.0100	6.7	684	0.0040	1.3	8.9	15.5	14.5	**14.5**	**2.93**	**6.0**
B-30	0.23	0.78	105	0.0100	5.9	63	0.0279	3.4	0.3	6.2	10.9	**6.2**	**4.43**	**0.8**
B-31	0.09	0.93	29	0.0200	1.3	81	0.0040	1.3	1.1	5.0	10.6	**5.0**	**4.73**	**0.4**
B-32	0.27	0.93	38	0.0200	1.5	199	0.0040	1.3	2.6	5.0	11.3	**5.0**	**4.73**	**1.2**
B-33	2.54	0.30	193	0.0100	20.0					20.0	11.1	**11.1**	**3.37**	**2.6**
S-1	27.50	0.78	168	0.0100	7.5	1448	0.0040	1.3	18.8	26.2	19.0	**19.0**	**2.63**	**56.4**
W-6	3.50	0.78	127	0.0100	6.5	787	0.0040	1.3	10.2	16.7	15.1	**15.1**	**2.87**	**7.8**
W-7	0.84	0.78	102	0.0100	5.8	194	0.0040	1.3	2.5	8.3	11.6	**8.3**	**3.92**	**2.6**
W-8	2.34	0.78	103	0.0100	5.8	717	0.0040	1.3	9.3	15.1	14.6	**14.6**	**2.93**	**5.3**
FW-1	0.83	0.93	13	0.0200	0.9	1074	0.0040	1.3	13.9	14.8	16.0	**14.8**	**2.90**	**2.2**
FW-2	0.72	0.78	76	0.0100	5.0	85	0.0040	1.3	1.1	6.1	10.9	**6.1**	**4.46**	**2.5**
FW-3	0.88	0.78	76	0.0100	5.0	163	0.0040	1.3	2.1	7.1	11.3	**7.1**	**4.21**	**2.9**
FW-4	1.75	0.78	55	0.0100	4.3	486	0.0040	1.3	6.3	10.6	13.0	**10.6**	**3.44**	**4.7**
FW-5	0.43	0.78	39	0.0100	3.6	224	0.0040	1.3	2.9	6.5	11.5	**6.5**	**4.36**	**1.5**
FW-6	0.82	0.78	63	0.0100	4.6	301	0.0040	1.3	3.9	8.5	12.0	**8.5**	**3.88**	**2.5**
FW-7	0.16	0.78	60	0.0100	4.5	83	0.0040	1.3	1.1	5.5	10.8	**5.5**	**4.60**	**0.6**

Profile Report
Engineering Profile - B5 TO C4 (PM_V6_OA_100YR_ADJUSTED.stsw)



Profile Report
Engineering Profile - C4 TO C8 (PM_V6_OA_100YR_ADJUSTED.stsw)



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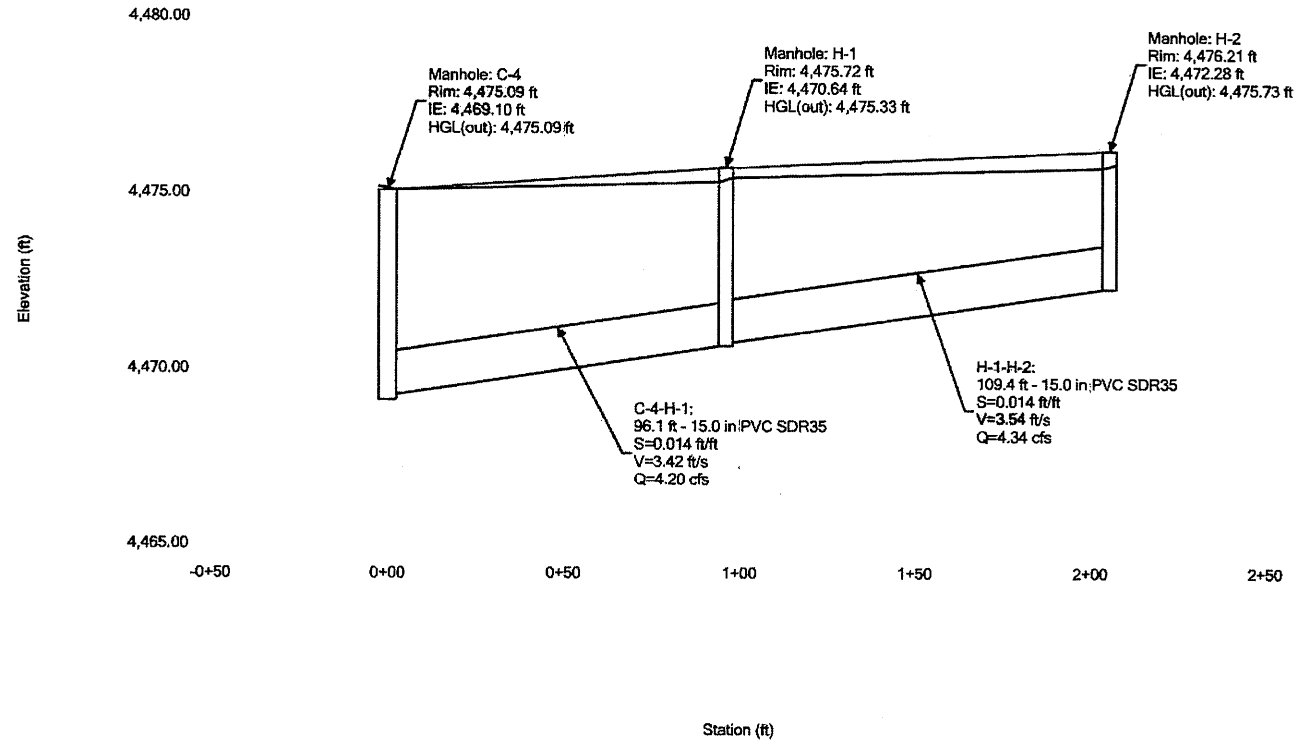
27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666

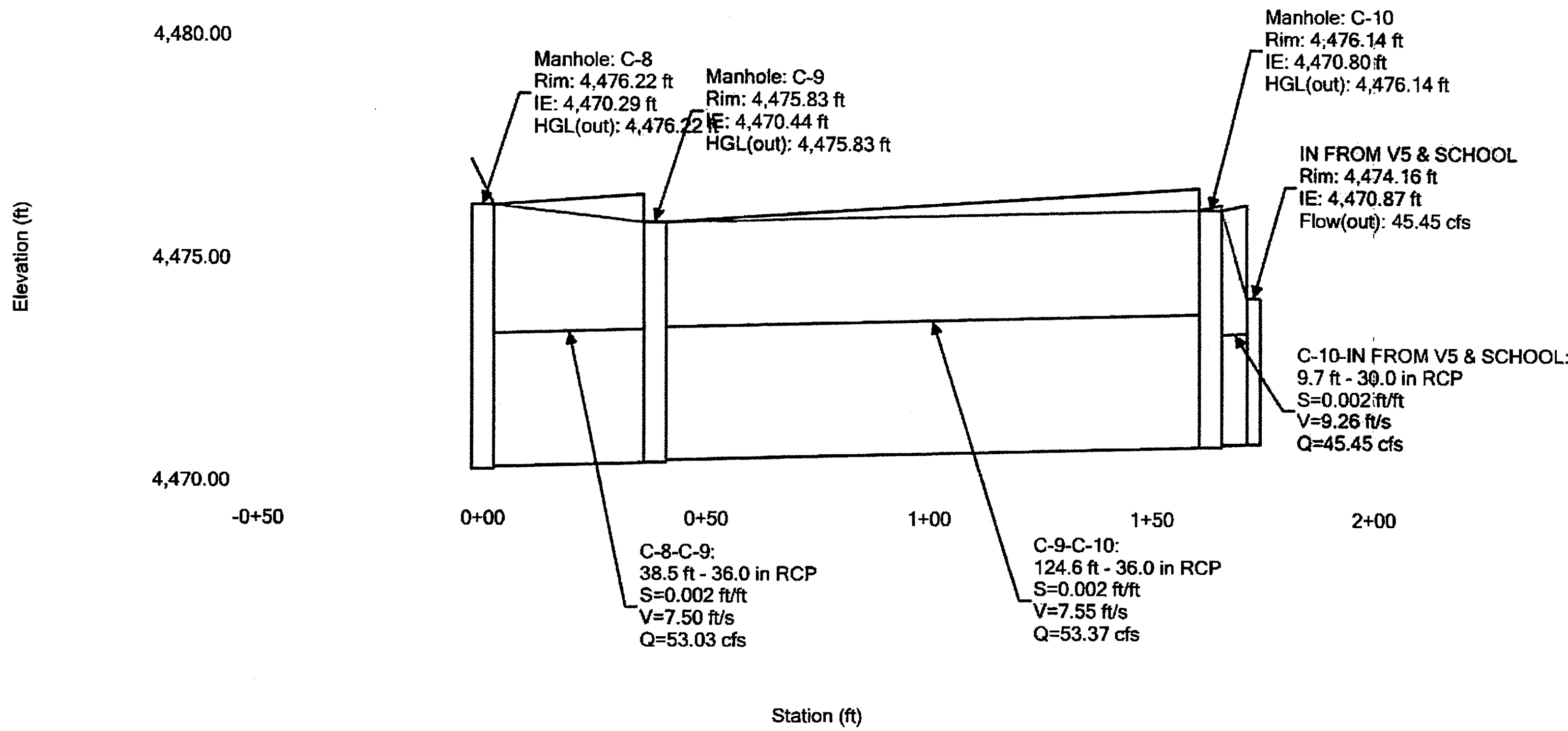
Profile Report

Engineering Profile - C4 TO H2 (PM_V6_OA_100YR_ADJUSTED.stsw)

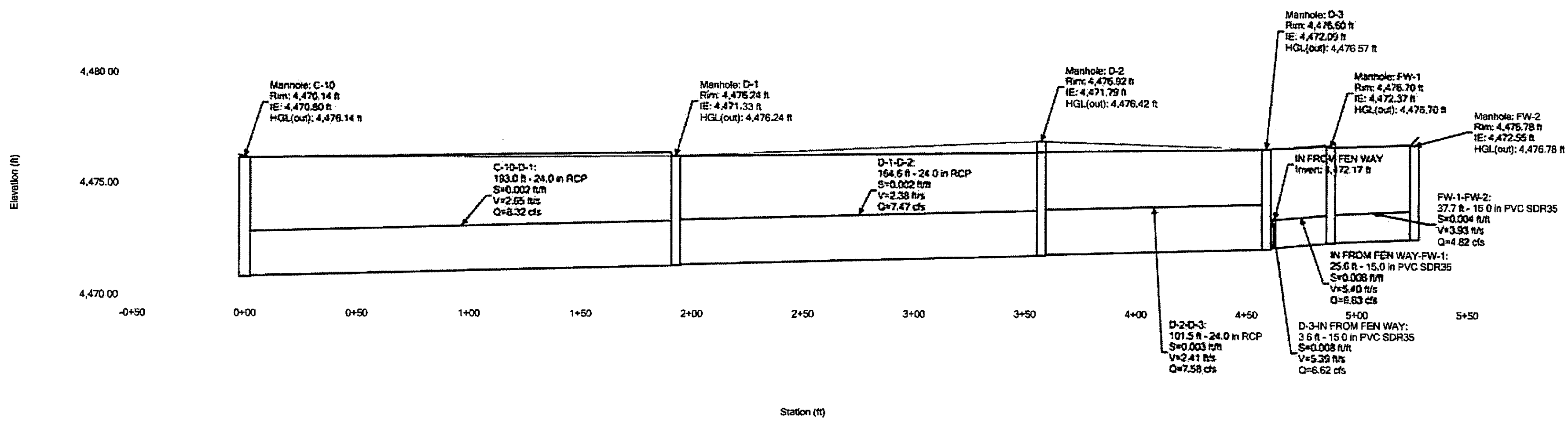


Profile Report

Engineering Profile - C8 TO SCHOOL (PM_V6_OA_100YR_ADJUSTED.stsw)

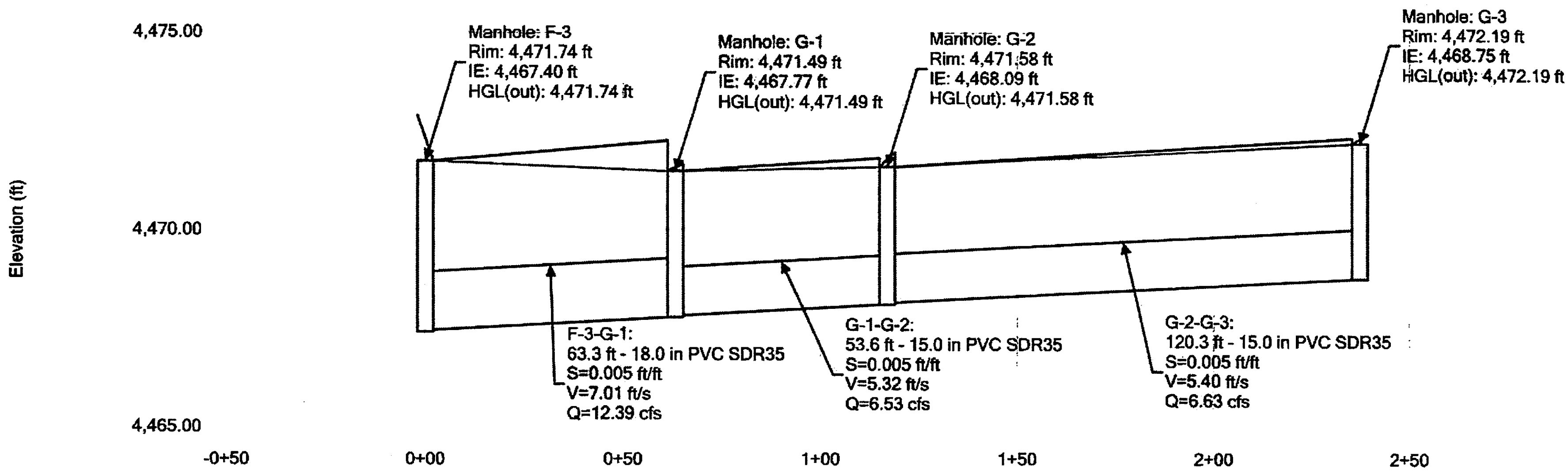


Profile Report
Engineering Profile - C10 TO FW2 (PM_V6_OA_100YR_ADJUSTED.stsw)



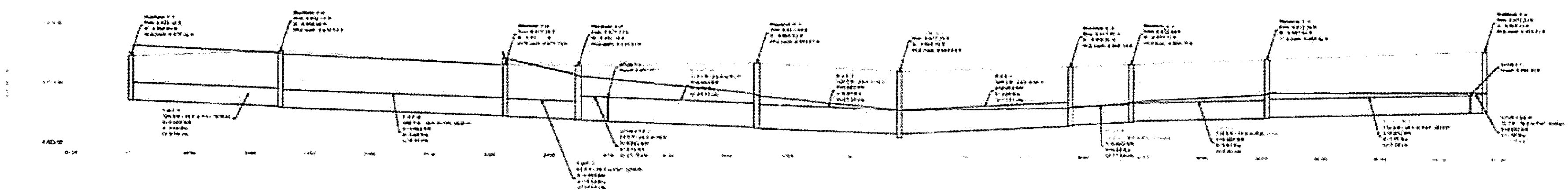
Profile Report

Engineering Profile - F3 TO G3 (PM_V6_OA_100YR_ADJUSTED.stsw)

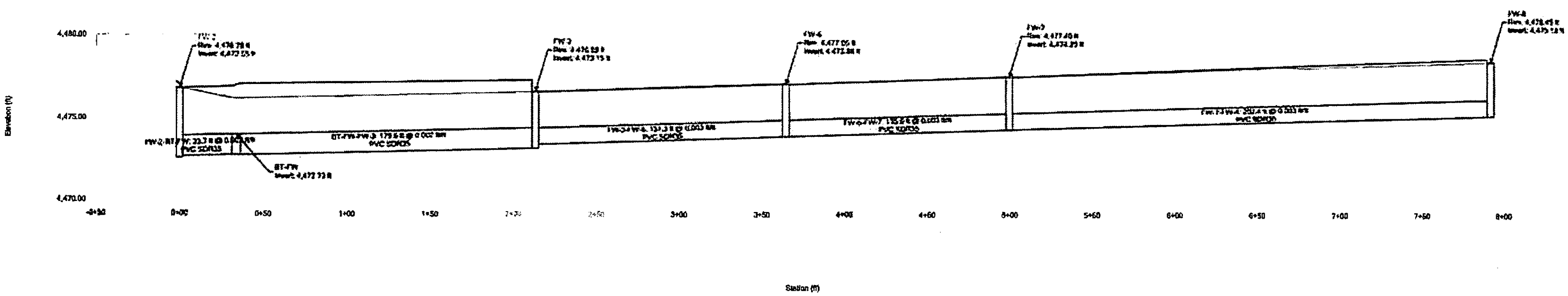


Profile Report

Engineering Profile - F5 TO E4 (PM_V6_OA_100YR_ADJUSTED.stsw)

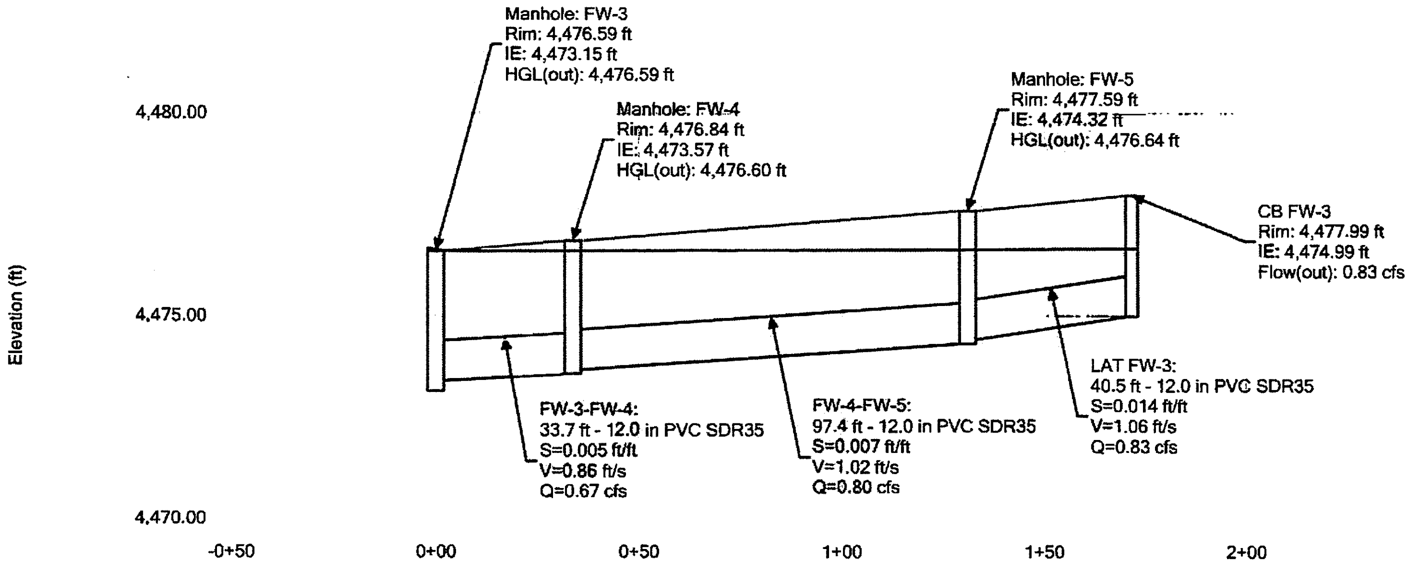


Profile Report
Engineering Profile - FW2 TO FW8 (PM_V6_OA_100YR_ADJUSTED.stsw)



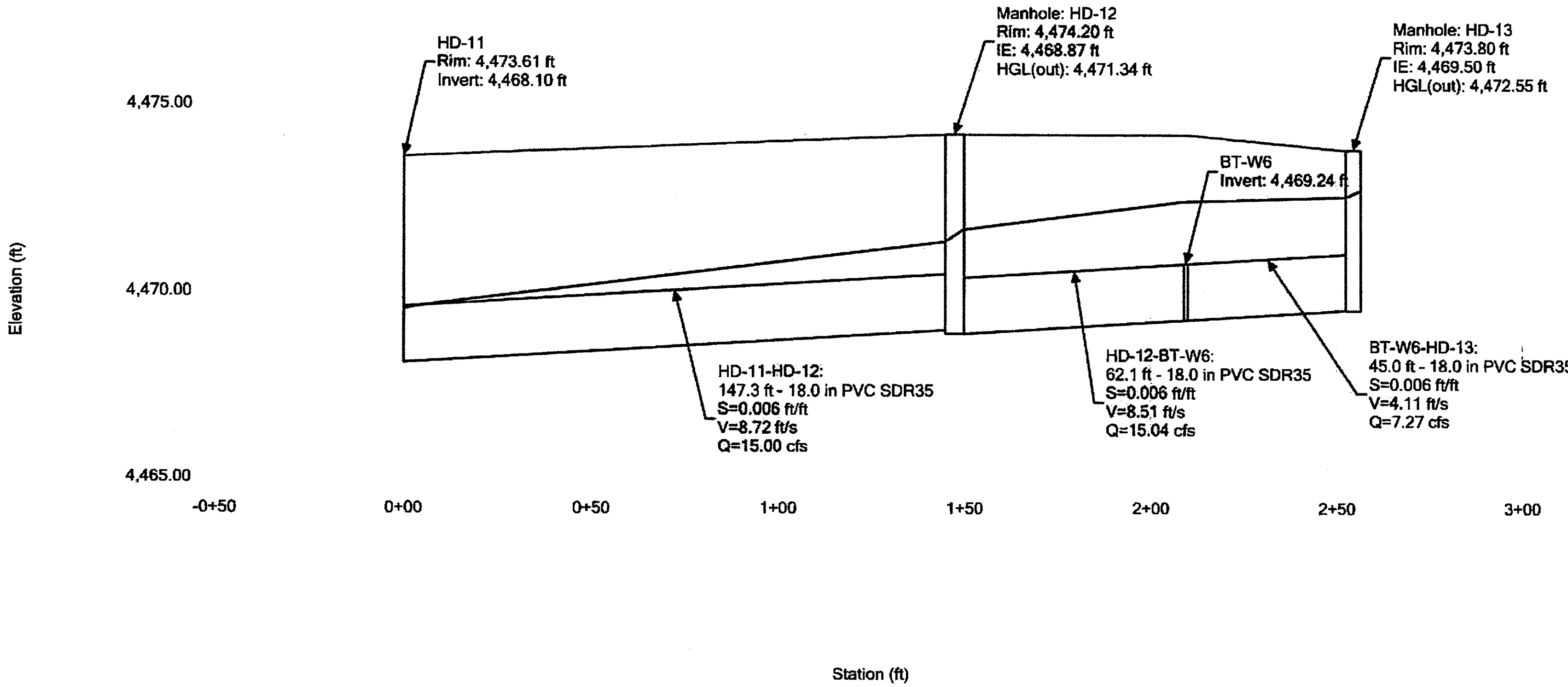
Profile Report

Engineering Profile - FW3 TO CB FW3 (PM_V6_OA_100YR_ADJUSTED.stsw)

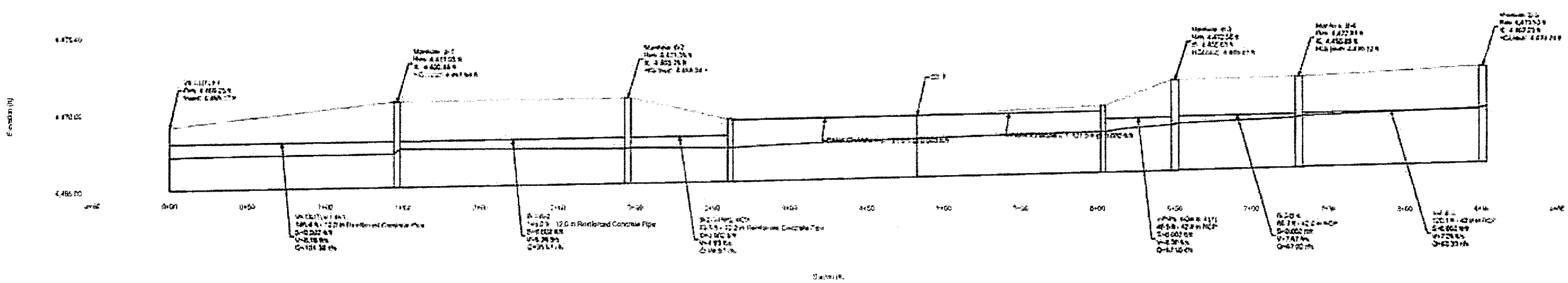


Profile Report

Engineering Profile - HD11 TO HD13 (PM_V6_OA_100YR_ADJUSTED.stsw)



Profile Report
Engineering Profile - OUTLET TO B5 (PM_V6_OA_100YR_ADJUSTED.stsw)



FlexTable: Catch Basin Table 100-year

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Inlet Drainage Area (acres)	Total Inlet Tc (min)	Flow (Captured) (cfs)
CB FW-6	4,479.21	4,476.21	0.820	8.500	2.50
CB FW-7	4,479.21	4,476.21	0.160	5.500	0.58
CB FW-3	4,477.99	4,474.99	0.250	7.100	0.83
CB FW-1	4,477.23	4,475.06	0.830	14.800	2.25
CB-3	4,476.74	4,474.72	1.780	13.900	4.21
CB-32	4,476.72	4,473.72	0.270	5.000	1.20
CB-31	4,476.72	4,473.72	0.090	5.000	0.40
CB FW-4	4,476.72	4,473.72	0.000	10.600	0.00
CB FW-5	4,476.72	4,473.72	0.000	6.500	0.00
CB-28	4,476.47	4,473.47	0.210	5.000	0.93
CB-27	4,476.47	4,473.47	0.190	5.000	0.84
CB FW-2	4,476.18	4,474.01	0.720	6.100	2.53
CB-6	4,475.74	4,472.74	0.870	8.200	2.70
CB-5	4,475.74	4,472.74	0.560	8.000	1.76
CB-2	4,475.66	4,472.66	0.000	5.000	0.00
CB-1	4,475.60	4,472.66	0.000	9.500	0.00
CB-4	4,475.22	4,472.22	2.140	10.500	5.80
CB W-6	4,474.37	4,470.06	3.500	15.100	7.88
IN FROM V5 & SCHOOL	4,474.16	4,470.87	22.000	19.000	45.45
CB-9	4,473.76	4,470.75	1.020	7.400	3.32
CB-10	4,473.71	4,470.71	1.480	10.100	4.07
CB W-8	4,473.65	4,470.65	2.340	14.600	5.37
CB W-7	4,473.65	4,470.65	0.840	8.300	2.59
CB-13	4,473.51	4,470.51	1.350	10.600	1.69
CB-12	4,473.51	4,470.51	0.730	9.400	1.13
CB-7	4,473.19	4,470.15	0.960	8.500	2.93
CB-8	4,473.19	4,470.15	0.450	5.500	1.63
CB-17	4,472.44	4,469.44	1.500	8.800	4.48
CB-16	4,472.44	4,469.40	2.500	15.100	5.63
CB-11	4,472.23	4,469.23	2.240	9.300	6.48
CB-23	4,472.23	4,469.23	0.990	10.400	2.02
CB-14	4,472.08	4,469.08	1.300	8.900	4.86
CB-15	4,472.08	4,469.08	1.330	10.700	3.58
CB-22	4,471.95	4,468.95	1.000	9.000	2.95
CB-24	4,471.54	4,468.54	0.380	6.900	1.27
CB-18	4,471.47	4,469.14	1.500	10.900	4.00
CB-19	4,471.47	4,469.14	1.000	10.600	2.70
CB-21	4,471.44	4,468.44	1.610	12.300	4.07
CB-20	4,471.44	4,468.44	0.810	8.400	2.48
CB-29	4,471.02	4,468.02	2.640	14.500	6.09
CB-30	4,471.02	4,468.02	0.230	6.200	0.80
CB-26	4,470.23	4,467.23	1.300	9.400	3.74
CB-25	4,470.23	4,467.23	1.440	10.000	6.66

FlexTable: Manhole Table 100-year

Label	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Elevation (Invert Out) (ft)	Diameter (in)	Flow (Total Out) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
FW-8	4,478.45	4,475.28	4,475.18	48.0	2.92	4,478.51	4,478.45
FW-5	4,477.59	4,474.42	4,474.32	48.0	0.80	4,476.64	4,476.64
FW-7	4,477.49	4,474.32	4,474.29	48.0	2.69	4,477.64	4,477.49
FW-6	4,477.05	4,473.88	4,473.86	48.0	2.62	4,477.20	4,477.05
D-2	4,476.92	4,471.84	4,471.79	48.0	7.47	4,476.46	4,476.42
FW-4	4,476.84	4,473.67	4,473.57	48.0	0.67	4,476.60	4,476.60
FW-2	4,476.78	4,472.65	4,472.55	48.0	4.82	4,477.18	4,476.78
FW-1	4,476.70	4,472.61	4,472.37	48.0	6.63	4,476.90	4,476.70
D-3	4,476.60	4,472.14	4,472.09	48.0	7.58	4,476.58	4,476.57
FW-3	4,476.59	4,473.40	4,473.15	48.0	3.20	4,476.65	4,476.59
D-1	4,476.24	4,471.38	4,471.33	48.0	8.32	4,476.25	4,476.24
H-2	4,476.21	4,472.38	4,472.28	48.0	4.34	4,475.83	4,475.73
H-1	4,475.72	4,470.74	4,470.64	48.0	4.20	4,475.44	4,475.33
HD-13	4,473.80	4,469.61	4,469.50	48.0	7.27	4,472.73	4,472.55
E-4	4,473.24	4,468.23	4,468.13	48.0	2.75	4,469.79	4,469.77
F-4	4,472.77	4,468.16	4,468.06	48.0	8.91	4,472.64	4,472.54
E-3	4,472.50	4,467.67	4,467.57	48.0	9.95	4,469.65	4,469.52
F-5	4,472.32	4,468.65	4,468.60	48.0	8.99	4,472.66	4,472.32
G-3	4,472.19	4,468.77	4,468.75	48.0	6.63	4,472.42	4,472.19
E-2	4,472.04	4,467.28	4,467.17	48.0	11.64	4,468.84	4,468.75
E-1	4,471.80	4,466.92	4,466.82	48.0	11.58	4,468.38	4,468.33
F-3	4,471.74	4,467.45	4,467.40	48.0	19.61	4,472.89	4,471.74
G-2	4,471.58	4,468.14	4,468.09	48.0	6.53	4,471.97	4,471.58
G-1	4,471.49	4,467.82	4,467.77	48.0	12.39	4,471.67	4,471.49
B-2	4,471.35	4,466.10	4,465.76	48.0	95.61	4,468.08	4,468.04
A-1	4,471.15	4,466.53	4,466.43	48.0	6.61	4,468.12	4,467.89
B-1	4,471.05	4,465.46	4,465.46	48.0	101.38	4,467.96	4,467.64
C-8	4,476.22	4,470.34	4,470.29	60.0	52.92	4,477.24	4,476.22
C-10	4,476.14	4,470.85	4,470.80	60.0	53.37	4,476.26	4,476.14
C-9	4,475.83	4,470.49	4,470.44	60.0	53.03	4,475.83	4,475.83
C-7	4,475.71	4,469.98	4,469.93	60.0	52.57	4,476.07	4,475.71
C-6	4,475.31	4,469.64	4,469.59	60.0	52.25	4,475.58	4,475.31
C-4	4,475.09	4,469.25	4,469.10	60.0	62.59	4,475.19	4,475.09
C-5	4,475.06	4,469.37	4,469.32	60.0	59.91	4,475.49	4,475.06
C-3	4,474.28	4,468.63	4,468.58	60.0	62.07	4,474.89	4,474.28
HD-12	4,474.20	4,468.87	4,468.97	60.0	15.00	4,471.67	4,471.34
C-2	4,474.11	4,468.46	4,468.41	60.0	61.93	4,474.75	4,474.11
C-1	4,473.58	4,468.04	4,467.99	60.0	66.31	4,473.61	4,473.58
B-5	4,473.53	4,467.28	4,467.23	60.0	68.39	4,470.90	4,470.79
B-4	4,472.81	4,466.93	4,466.88	60.0	67.92	4,470.25	4,470.12
B-3	4,472.56	4,466.68	4,466.63	60.0	67.60	4,469.71	4,469.61
F-1	4,471.99	4,466.61	4,466.52	60.0	21.59	4,469.43	4,469.21
F-2	4,471.72	4,467.19	4,467.14	60.0	21.76	4,470.90	4,470.82

Conduit FlexTable: Combined Pipe/Node Report 100-year

Label	Start Node	Stop Node	Length (Unified) (ft)	Slope (Calculated) (ft/ft)	Capacity (Full Flow) (cfs)	Invert (Start) (ft)	Invert (Stop) (ft)	Flow (cfs)	Velocity (ft/s)
HD-12-BT-W6	BT-W6	HD-12	62.1	0.006	10.49	4,469.24	4,468.87	15.04	8.51
BT-W6-HD-13	HD-13	BT-W6	45.0	0.006	10.49	4,469.50	4,469.24	7.27	4.11
LAT W-6	CB W-6	BT-W6	5.8	0.364	50.68	4,471.37	4,469.24	7.88	30.01
LAT FW-6	CB FW-6	FW-8	67.0	0.014	5.46	4,476.21	4,475.28	2.50	3.18
LAT FW-7	CB FW-7	FW-8	36.1	0.026	7.43	4,476.21	4,475.28	0.58	0.74
FW-7-FW-8	FW-8	FW-7	292.4	0.003	2.51	4,475.18	4,474.32	2.92	3.72
LAT FW-3	CB FW-3	FW-5	40.5	0.014	5.49	4,474.99	4,474.42	0.83	1.06
FW-4-FW-5	FW-5	FW-4	97.4	0.007	3.78	4,474.32	4,473.67	0.80	1.02
FW-6-FW-7	FW-7	FW-6	135.0	0.003	2.55	4,474.29	4,473.88	2.69	3.42
LAT FW-1	CB FW-1	FW-1	37.7	0.065	11.81	4,475.06	4,472.61	2.25	2.87
FW-3-FW-6	FW-6	FW-3	151.3	0.003	2.55	4,473.86	4,473.40	2.62	3.34
D-2-D-3	D-3	D-2	101.5	0.003	11.31	4,472.09	4,471.84	7.58	2.41
D-1-D-2	D-2	D-1	164.6	0.002	11.31	4,471.79	4,471.38	7.47	2.38
FW-3-FW-4	FW-4	FW-3	33.7	0.005	3.29	4,473.57	4,473.40	0.67	0.86
LAT FW-5	CB FW-5	FW-4	12.7	0.004	2.91	4,473.72	4,473.67	0.00	0.00
LAT FW-4	CB FW-4	FW-4	35.0	0.001	1.75	4,473.72	4,473.67	0.00	0.00
FW-1-FW-2	FW-2	FW-1	37.7	0.004	5.12	4,472.55	4,472.41	4.82	3.93
FW-2-BT-FW	BT-FW	FW-2	33.7	0.002	4.09	4,472.73	4,472.65	4.85	3.95
LAT 03	CB-3	BT-3-4	32.1	0.134	16.98	4,474.72	4,470.41	4.21	17.92
LAT 32	CB-32	D-3	23.4	0.067	12.03	4,473.72	4,472.14	1.20	1.52
LAT 31	CB-31	D-3	10.7	0.147	17.76	4,473.72	4,472.14	0.40	0.51
IN FROM FEN WAY-FW-1	FW-1	IN FROM FEN WAY	25.6	0.008	7.43	4,472.37	4,472.17	6.63	5.40
D-3-IN FROM FEN WAY	IN FROM FEN WAY	D-3	3.6	0.008	7.42	4,472.17	4,472.14	6.62	5.39
BT-FW-FW-3	FW-3	BT-FW	179.6	0.002	4.06	4,473.15	4,472.73	3.20	2.61
LAT 28	CB-28	D-1	29.1	0.070	12.27	4,473.47	4,471.43	0.93	1.19
LAT 27	CB-27	D-1	5.4	0.378	28.49	4,473.47	4,471.43	0.84	1.07
C-10-D-1	D-1	C-10	193.0	0.002	11.31	4,471.33	4,470.85	8.32	2.65
C-8-C-9	C-9	C-8	38.5	0.002	33.35	4,470.44	4,470.34	53.03	7.50
C-7-C-8	C-8	C-7	128.1	0.002	32.80	4,470.29	4,469.98	52.92	7.49
H-1-H-2	H-2	H-1	109.4	0.014	9.96	4,472.28	4,470.74	4.34	3.54
LAT 05	CB-5	H-2	59.2	0.006	3.61	4,472.74	4,472.38	1.76	2.24
LAT 06	CB-6	H-2	72.7	0.005	3.27	4,472.74	4,472.38	2.70	3.44
LAT FW-2	CB FW-2	BT-FW	16.9	0.076	12.75	4,474.01	4,472.73	2.53	3.22
C-10-IN FROM V5 & SCHOOL	IN FROM V5 & SCHOOL	C-10	9.7	0.002	18.59	4,470.87	4,470.85	45.45	9.26
C-9-C-10	C-10	C-9	124.6	0.002	33.26	4,470.80	4,470.49	53.37	7.55
LAT 02	CB-2	C-9	11.7	0.173	19.26	4,472.66	4,470.64	0.00	0.00
LAT 01	CB-1	C-9	47.5	0.042	9.55	4,472.66	4,470.64	0.00	0.00
C-4-H-1	H-1	C-4	96.1	0.014	10.10	4,470.64	4,469.25	4.20	3.42
C-6-C-7	C-7	C-6	116.5	0.002	33.35	4,469.93	4,469.64	52.57	7.44
BT-3-4-C-6	C-6	BT-3-4	68.1	0.002	33.35	4,469.59	4,469.42	52.25	7.39
LAT 04	CB-4	BT-3-4	7.5	0.242	22.80	4,472.22	4,470.41	5.80	7.38
C-4-C-5	C-5	C-4	68.3	0.002	33.28	4,469.32	4,469.15	59.91	8.48
C-3-C-4	C-4	C-3	187.3	0.003	33.41	4,469.10	4,468.63	62.59	8.85
C-5-BT-3-4	BT-3-4	C-5	15.7	0.002	33.35	4,469.41	4,469.37	59.96	8.48
C-2-C-3	C-3	C-2	47.1	0.003	33.67	4,468.58	4,468.46	62.07	8.78
HD-11-HD-12	HD-12	HD-11	147.3	0.006	10.49	4,468.97	4,468.10	15.00	8.49
C-1-C-2	C-2	C-1	145.6	0.003	33.63	4,468.41	4,468.04	61.93	8.76

Conduit FlexTable: Combined Pipe/Node Report 100-year

Label	Start Node	Stop Node	Length (Unified) (ft)	Slope (Calculated) (ft/ft)	Capacity (Full Flow) (cfs)	Invert (Start) (ft)	Invert (Stop) (ft)	Flow (cfs)	Velocity (ft/s)
LAT W-7	CB W-7	HD-13	30.6	0.034	8.54	4,470.65	4,469.61	2.59	3.30
LAT W-8	CB W-8	HD-13	41.4	0.025	7.34	4,470.65	4,469.61	5.37	6.84
LAT 09	CB-9	C-1	33.5	0.081	13.17	4,470.75	4,468.04	3.32	4.23
LAT 10	CB-10	B-5	32.7	0.105	15.00	4,470.71	4,467.28	4.07	16.24
LAT 07	CB-7	C-1	57.7	0.037	8.86	4,470.15	4,468.04	2.93	3.72
LAT 08	CB-8	C-1	40.6	0.052	10.56	4,470.15	4,468.04	1.63	2.08
B-5-C-1	C-1	B-5	282.5	0.002	33.35	4,467.99	4,467.28	66.31	9.38
B-4-B-5	B-5	B-4	120.1	0.002	50.30	4,467.23	4,466.93	68.39	7.11
LAT 13	CB-13	E-4	23.5	0.097	14.41	4,470.51	4,468.23	1.69	12.28
LAT 12	CB-12	E-4	39.5	0.058	11.12	4,470.51	4,468.23	1.13	9.10
STUB E3-E-4	E-4	STUB E3	12.2	0.002	6.83	4,468.13	4,468.10	2.75	1.56
B-3-B-4	B-4	B-3	80.7	0.002	50.30	4,466.88	4,466.68	67.92	7.06
F-3-F-4	F-4	F-3	188.0	0.003	7.78	4,468.06	4,467.45	8.91	5.04
F-4-F-5	F-5	F-4	125.0	0.004	8.10	4,468.60	4,468.16	8.99	5.09
J-PIPE-BOX-B-3 (1)	B-3	PARK INLET	46.5	0.002	50.30	4,466.63	4,466.51	67.60	7.03
LAT 15	CB-15	E-3	63.9	0.022	6.88	4,469.08	4,467.67	3.58	8.85
LAT 14	CB-14	E-3	75.4	0.019	6.33	4,469.08	4,467.67	4.86	6.19
E-3-STUB E3	STUB E3	E-3	172.0	0.002	6.83	4,468.10	4,467.67	2.74	1.55
E-2-E-3	E-3	E-2	114.6	0.002	6.83	4,467.57	4,467.28	9.95	5.63
LAT 17	CB-17	F-5	26.0	0.030	8.07	4,469.44	4,468.65	4.48	5.71
LAT 16	CB-16	F-5	40.8	0.018	6.28	4,469.40	4,468.65	5.63	7.17
LAT 11	CB-11	PARK INLET	35.7	0.076	12.79	4,469.23	4,466.51	6.48	16.34
LAT 23	CB-23	E-2	9.1	0.214	21.41	4,469.23	4,467.28	2.02	17.12
G-2-G-3	G-3	G-2	120.3	0.005	5.98	4,468.75	4,468.14	6.63	5.40
LAT 19	CB-19	G-3	40.5	0.009	4.43	4,469.14	4,468.77	2.70	3.44
LAT 18	CB-18	G-3	57.6	0.006	3.71	4,469.14	4,468.77	4.00	5.10
E-1-E-2	E-2	E-1	51.2	0.005	9.66	4,467.17	4,466.92	11.64	6.59
B-2-F-1	F-1	B-2	120.2	0.003	13.38	4,466.52	4,466.10	21.59	6.87
F-1-STUB F1	STUB F1	F-1	124.9	0.003	13.38	4,467.05	4,466.61	21.73	6.92
LAT 22	CB-22	F-2	6.2	0.285	24.74	4,468.95	4,467.19	2.95	3.76
B-2-E-1	E-1	B-2	144.1	0.005	16.00	4,466.82	4,466.10	11.58	5.55
F-2-F-3	F-3	F-2	61.4	0.003	7.99	4,467.40	4,467.19	19.61	11.10
F-3-G-1	G-1	F-3	63.3	0.005	9.71	4,467.77	4,467.45	12.39	7.01
STUB F1-F-2	F-2	STUB F1	25.0	0.003	13.38	4,467.14	4,467.05	21.76	6.93
G-1-G-2	G-2	G-1	53.6	0.005	5.96	4,468.09	4,467.82	6.53	5.32
LAT 24	CB-24	B-2	47.5	0.051	10.50	4,468.54	4,466.10	1.27	9.05
LAT 21	CB-21	G-1	32.5	0.020	6.50	4,468.44	4,467.80	4.07	5.18
LAT 20	CB-20	G-1	8.5	0.075	12.69	4,468.44	4,467.80	2.48	3.16
B-2-J-PIPE-BOX	PARK OUTLET	B-2	66.5	0.002	119.61	4,465.89	4,465.76	68.97	6.94
B-1-B-2	B-2	B-1	149.0	0.002	120.03	4,465.76	4,465.46	95.61	7.65
LAT 30	CB-30	A-1	43.0	0.035	8.62	4,468.02	4,466.53	0.80	6.87
LAT 29	CB-29	A-1	22.8	0.065	11.85	4,468.02	4,466.53	6.09	7.75
OUT TO R.M. DRIVE-A -1	A-1	OUT TO R.M. DRIVE	30.4	0.005	3.25	4,466.43	4,466.28	6.61	8.41
V6 OUTLET-B-1	B-1	V6 OUTLET	146.4	0.002	119.06	4,465.46	4,465.17	101.38	7.73
LAT 25	CB-25	B-1	68.2	0.019	6.32	4,467.23	4,465.96	6.66	8.48
LAT 26	CB-26	B-1	21.1	0.060	11.37	4,467.23	4,465.96	3.74	4.76

FlexTable: Channel Table

Label	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Flow (cfs)	Velocity (ft/s)	Depth (In) (ft)	Depth (Out) (ft)	Depth (Critical) (ft)	Depth (Normal) (ft)
PARK CHANNEL 1	PARK INLET	CS-1	4,466.51	4,466.21	121.0	0.002	73.60	1.58	2.64	2.49	1.18	2.82
PARK CHANNEL 2	CS-1	PARK OUTLET	4,466.21	4,465.89	121.0	0.003	71.27	1.61	2.49	2.21	1.16	2.74

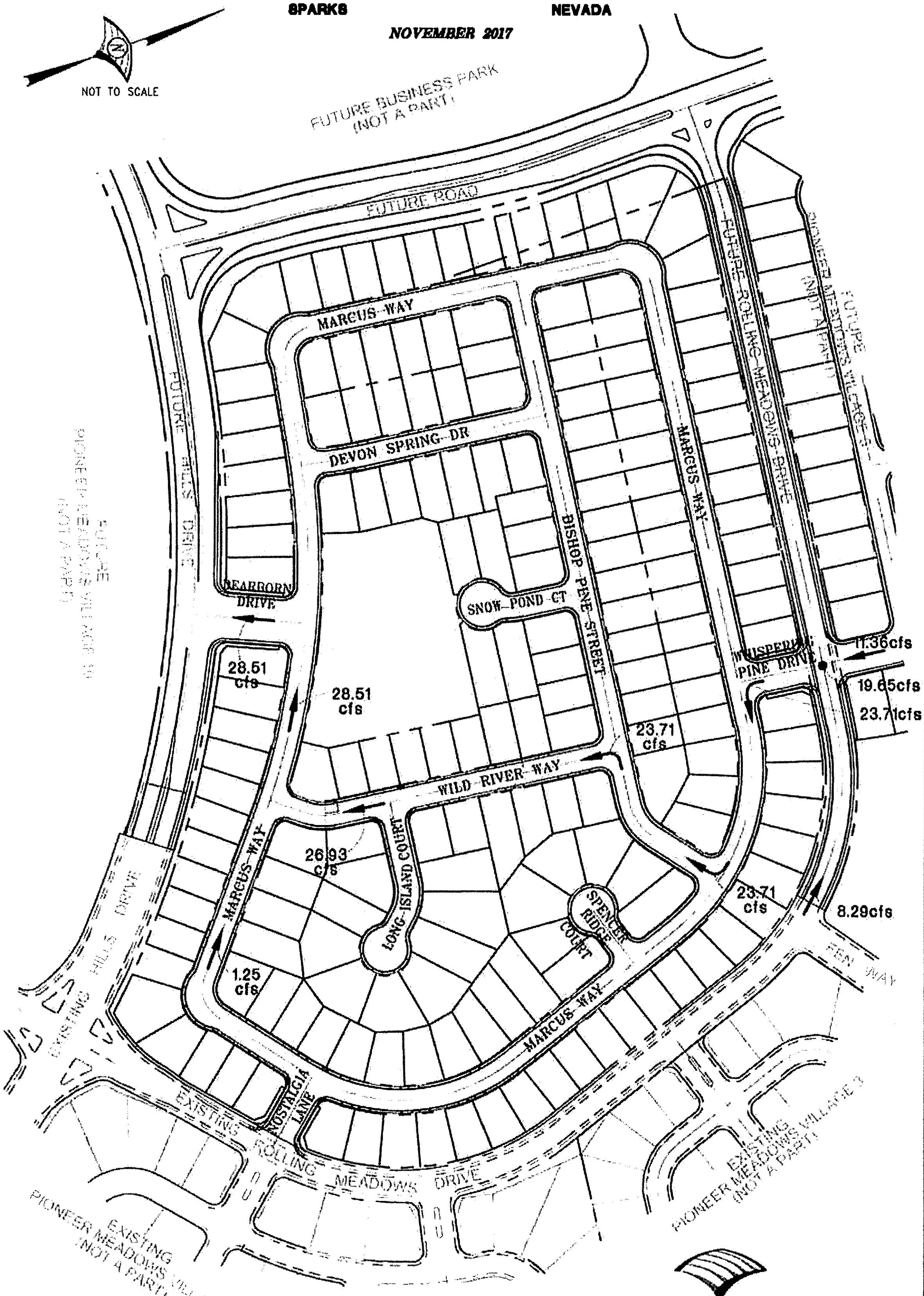
OVERLAND RELEASE FLOW MAP

PIONEER MEADOWS VILLAGE 6

LENNAR RENO, LLC

SPARKS **NEVADA**

NOVEMBER 2017



WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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Cross Section for 0.4% STREET SECTION MAXIMUM FLOW

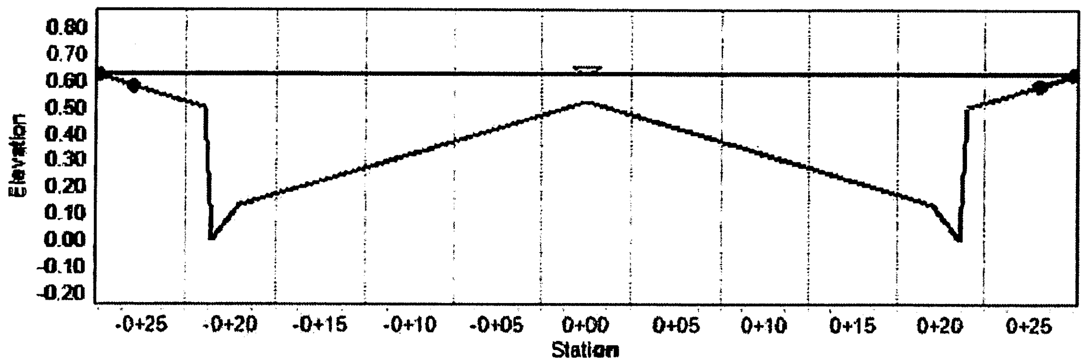
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00400	ft/ft
Normal Depth	0.62	ft
Discharge	37.27	ft^3/s

Cross Section Image



Appendix D – CB Bypass and Overland Release Analysis

Overland Release Flow Map
100-Year Storm Adjusted Area and Flow Table

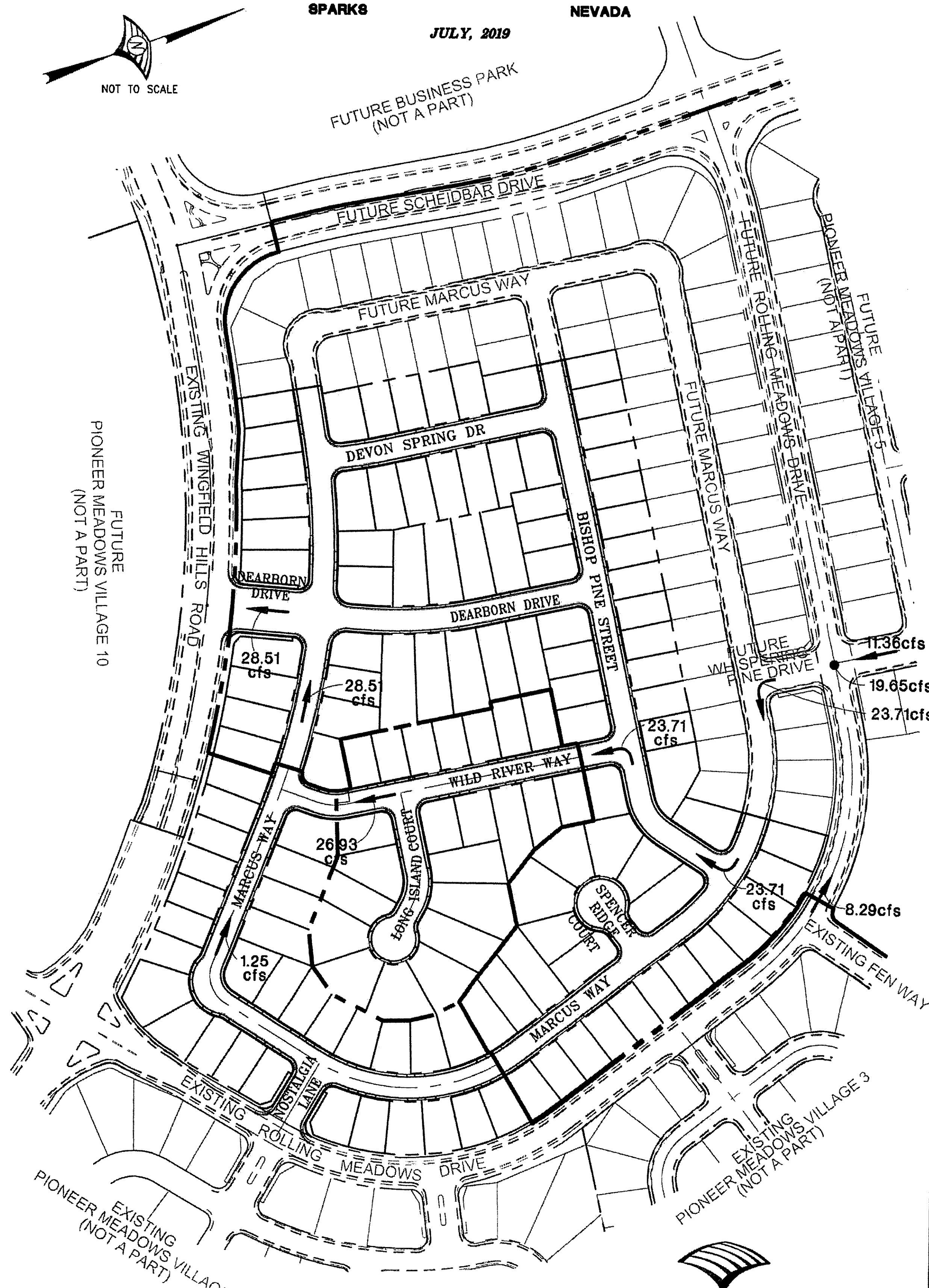
OVERLAND RELEASE FLOW MAP

PIONEER MEADOWS VILLAGE 6

LENNAR RENO, LLC

SPARKS **NEVADA**

JULY, 2019



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100-YEAR STORM ADJUSTED AREA AND FLOW TABLE						
Label	Area (acres)	Area (acres)	Area (Difference)	Flow (cfs)	Flow (cfs)	Flow (Difference)
CM-1	1.02	0	1.02	2.91	0	2.91
CM-2	0.31	0	0.31	1.15	0	1.15
CM-3	1.78	1.78	0	4.21	4.21	0
CM-4	2.14	2.14	0	5.8	5.8	0
CM-5	0.56	0.56	0	1.76	1.76	0
CM-6	0.87	0.87	0	2.7	2.7	0
CM-7	0.96	0.96	0	2.93	2.93	0
CM-8	0.45	0.45	0	1.63	1.63	0
CM-9	1.02	1.02	0	3.32	3.32	0
CM-10	1.48	1.48	0	4.07	4.07	0
CM-11	2.24	2.24	0	6.48	6.48	0
CM-12	0.73	0.73	0	2.1	2.1	0
CM-13	1.35	1.35	0	3.64	3.64	0
CM-14	1.3	1.3	0	3.86	3.86	0
CM-15	1.33	1.33	0	3.58	3.58	0
CM-16	2.95	2.5	0.45	6.64	5.63	1.01
CM-17	1.58	1.5	0.08	4.72	4.48	0.24
CM-18	2.49	1.5	0.99	6.65	4	2.65
CM-19	1.21	1	0.21	3.27	2.7	0.57
CM-20	0.81	0.81	0	2.48	2.48	0
CM-21	1.61	1.61	0	4.07	4.07	0
CM-22	1.11	1	0.11	3.28	2.95	0.33
CM-23	0.99	0.99	0	2.69	2.69	0
CM-24	0.38	0.38	0	1.27	1.27	0
CM-25	1.44	1.44	0	3.97	3.97	0
CM-26	1.3	1.3	0	3.74	3.74	0
CM-27	0.19	0.19	0	0.84	0.84	0
CM-28	0.21	0.21	0	0.93	0.93	0
CM-29	2.64	2.64	0	6.09	6.09	0
CM-30	0.23	0.23	0	0.8	0.8	0
CM-31	0.09	0.09	0	0.4	0.4	0
CM-32	0.27	0.27	0	1.2	1.2	0
CM-33	2.54	2.54	0	2.59	2.59	0
CM-FW1	0.83	0.83	0	2.25	2.25	0
CM-FW2	0.72	0.72	0	2.53	2.53	0
CM-FW3	0.88	0.25	0.63	2.92	0.83	2.09
CM-FW4	1.75	0	1.75	4.72	0	4.72
CM-FW5	0.43	0	0.43	1.48	0	1.48
CM-FW6	0.82	0.82	0	2.5	2.5	0
CM-FW7	0.16	0.16	0	0.58	0.58	0
CM-V5 SCHOOL	27.5	22	5.5	56.81	45.45	11.36
CM-W6	3.5	3.5	0	7.88	7.88	0
CM-W7	0.84	0.84	0	2.59	2.59	0
CM-W8	2.34	2.34	0	5.37	5.37	0
		Total	**11.48**		**Total**	**28.51**